Amateur Radio

73 Magazine

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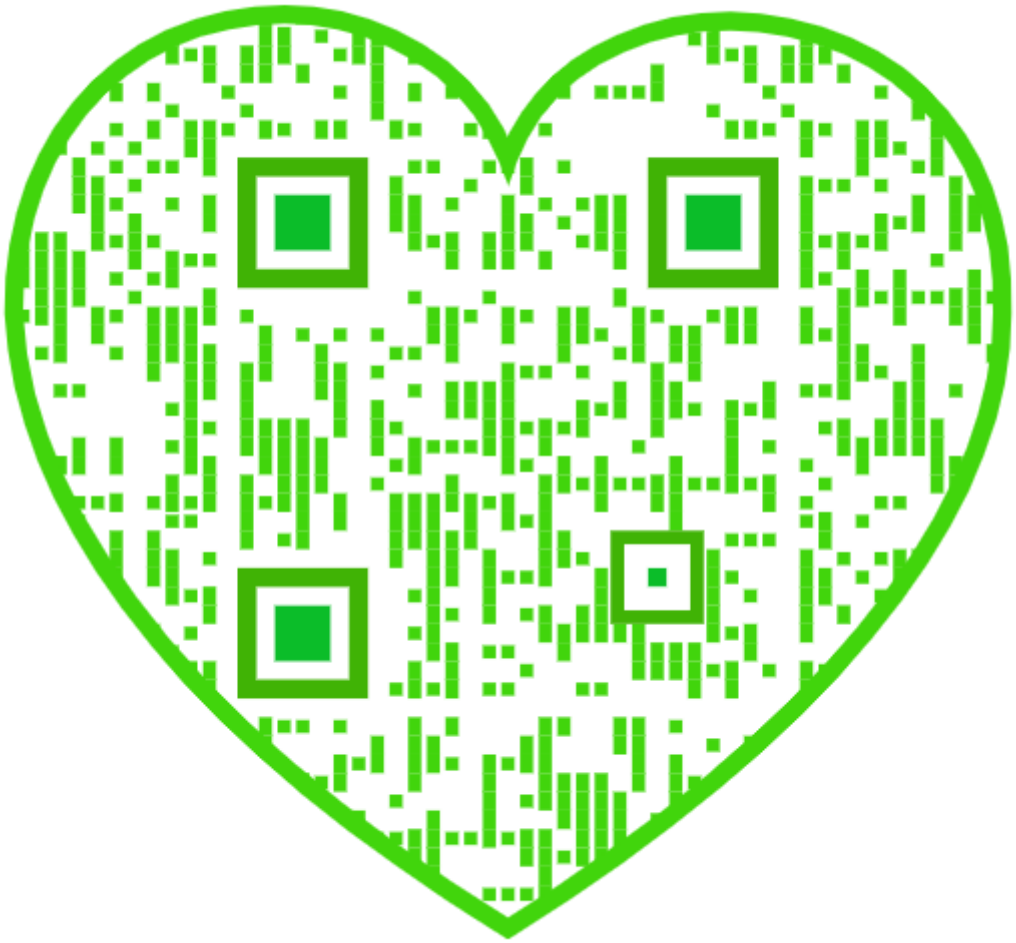
January 1964



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73

Magazine

Wayne Green W2NSD/1
Editor, etcetera

January, 1964

Vol. XV, No. 1

Cover: Wayne Peirce K3SUK, who, by the way, also did the December cover.

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INCENTIVE LICENSING

I am upset. I am upset over the idea of incentive licensing. I know, as I watch the government going into more and more businesses and controlling more and more things tighter and tighter, that I am opposing a relentless force. I still feel like speaking out when someone wants to get something done and their first turn is to the government. What has happened to free enterprise?

The case in point is the ARRL's petitioning of the FCC to force the amateur to study more radio theory in order to hold on to his present privileges. If the ARRL feels that the amateurs should spend more time learning theory why didn't they at least make even a slight attempt to talk the amateurs into this idea and lead them in that direction? Why, without even a try at getting hams to learn, did they turn immediately to the government and petition them to force everyone to do what the ARRL wanted?

Is government force the only "incentive" that will work? Shades of Russia.

If I am wrong and it actually is impossible to get amateurs to voluntarily improve themselves, then I can see some application for incentive licensing. This does not mean that I am not upset over the ARRL proposals. I am very upset over them.

The ARRL says we are going to pot. This is unarguable because there is no possible way to prove a case pro and con. I don't believe we are going to pot. I am distressed and disappointed to see the ARRL and fellows like Bill Orr tearing down our wonderful hobby.

I am upset over the way that the ARRL went about putting in its petition to the FCC. Now that it is in we can see that there never was any intention at any time of asking the membership what they thought. Apparently even the Directors were hoodwinked to a degree too, though this is their own fault for leaving decisions of this magnitude to the League Officials. One Director wrote to me in confidence that *he* was opposed to incentive licensing. Rather than go into detail over this aspect of the petition I recommend that you read the two rebuttals to RM-499 that I've included in this issue. They are both different enough to warrant publication and both make many good points.

I am upset over the actual proposals made by the ARRL. Why was their schedule of taking away phone bands from the great mass of licensees planned to present the worst possible picture of occupancy of our most precious bands just before Geneva Conference time? Why did they decide to have General and Conditional licensees re-examined and yet exclude the Advanced Class licensees? Why did they decide to take away privileges from the great proportion of amateurs rather than offering them additional privileges? Why did they make no provision whatever for incentive for the CW operator? Why was absolutely no announcement of their actual plan made until after it had been submitted to the FCC?

I am upset over the rumors that have been circulating about RM-499. I have had several reports that a major League Official has actually named an FCC official as acting advisor to the ARRL in rigging RM-499. I do not believe that an FCC official would be guilty of such collusion and I think it poor ethics on the part of the ARRL to try to convince amateurs through a strategem of this nature that there is no use in fighting the proposal since it is actually FCC sponsored and therefore will obviously go through. This is a terrible thing to say for it could easily wreck the career of the FCC official involved. I have not the slightest indication from any source (and I have a lot of sources) that the FCC was in any way a party to this proposal or that they look upon it with even the slightest degree of favor. In view of the reported ARRL allegations many of us are watching the FCC procedure with more than the usual interest to see if RM-499 gets any more preferential treatment than, say, RM-399.

de

W2NSD/1

never say die

ARRL - RM499 & SUCH

Geneva

The ARRL, after many explanations for their actions, brought up the international situation in their September QST editorial. Better late than never. At least we know that they are thinking about the next Geneva conference, even if they have managed to come up with one of the worst possible solutions to the problems involved. This is a change from the last conference where nothing whatever was done except keep fingers crossed and hope for the best.

I feel very helpless about all this. I can see the situation and I can see some things that should be done about it, but I am so completely tied down to running 73 that I can't do anything about it.

What sort of things would help? Well, first of all I think we have to spread the word about what we face in two to six years at Geneva. The situation as it stands now is a grim one and time is growing short, maybe too short, to turn the tide. We need to get in gear fast and start in doing everything possible to insure the emergence of amateur radio from Geneva with its short wave bands.

The best defense is a good offense. We need the best possible publicity at home and abroad. This means we should have a potent lobby in Washington so that the value of the amateur "service" is well known to all branches of the government and Congress. I feel that an office in Washington is also of great importance as a liason between the many government agencies which have questions or problems relating to amateurs and ourselves.

On the international scene we should work with the amateurs in foreign countries to prove to their governments the many advantages of a strong amateur service. By convincing them to pattern their rules after our own FCC regulations we will be able to bring about a sharp rise in amateur radio in many areas of the world. An understanding of the benefits of amateur radio and a strong constituentcy in foreign countries will help us tremendously when the question of frequencies is discussed at Geneva.

We should be able to send a small group (perhaps three) of mature and experienced amateurs to visit the newer countries and help our cause by going to the governments and selling them on the benefits to them of encouraging amateur radio to blossom forth in their country. We should be prepared to help interested men in these countries to get their equipment, to get started and spread the seed of interest. I doubt seriously if we would run into any problems in getting the cooperation of our manufacturers in providing equipment for something like this. I know that thousands of amateurs all over the country would be happy to find some foreign ham that could use some of the gear that is stashed away in the attic, cellar or garage. By setting up such a procedure we could in a few short years cause amateur radio to grow tremendously.

What country is going to send a delegate to Geneva (in all probability a ham) and let him vote for the cutting back of our amateur bands if this will discourage their own citizens from pursuing electronics.

We should start soon on a campaign to eliminate those liddisms which are being made into such a big deal. With just a bit of encouragement and wit I'll bet that we can cure all of the popular complaints. We cured TVI with magazine articles and TVI committees, why not cure lids with articles and Lid Committees? When a Lid Committee runs up against a psycho (and we have 'em), this should be reported to the FCC.

The short wave broadcasters will be sorely distressed to see me bring this up again, but one other important function we could provide

"Amateur Radio Exists Because of the

would be as much discouragement as possible to short wave broadcasters. If we raise an organized fuss every time a short wave station station settles down in a ham band, barrage the responsible government with complaints and tell them that we, all 250,000 of us, will do everything in our power to keep anyone we know from ever going to visit their country or buying any product of their country, I think we can be effective. We can also make them aware of the microscopic short wave listening audience that they have available in this country.

Since the pressure for more frequencies will be on from all fronts one of the most valuable efforts we could undertake would be a spectrum analysis of the short waves. Since we have amateurs everywhere we could organize a world-wide listening program and eventually come up with facts and figures on the actual utilization of the short waves. Anyone who has listened much knows that the amount of productive use of these frequencies is pathetically small. If we could turn up at Geneva with the goods on the other services we would be in a good position to demand a correction of their inefficiency instead of submitting our amateur bands to amputation.

An analysis of this magnitude would be very costly, though I'll bet that we could get one of the computer companies to make time available for the inspection of our data once compiled. We could probably get the loan of the card punchers and other gear too . . . . but we would still need a staff of people to correspond and punch the cards.

The ARRL has been approached on several of these ideas and has turned them down flatly. Where do we turn? The Institute of Amateur Radio is far too small right now to undertake anything of this magnitude.

The ARRL, though it makes a small profit each year and has quite a bundle in the bank, couldn't possibly undertake a program such as I have outlined without a major dues change. Something like this should cost a minimum of $250,000 a year . . . and $500,000 would be more like it. This is precious little to spend at this critical time. How much is it worth to each of us to keep amateur radio going? If 50,000 amateurs put in $10 a year we could do this and do it well.

Ten dollars a year for insurance on your equipment to make sure that you are going to be able to use it in a few years. Peanuts. Ask any sports car owner what it costs to belong to the Sports Car Club of America . . . or any other sports car club. There are few clubs that don't charge more than ten dollars a year in any field of interest or hobby.

One of the best things that could happen would be for the ARRL to cut out this incentive licensing nonsense, increase the League membership dues $10 a year and get to work on all fronts. I would like to see them do it. But I know darned well they won't. There is also a question of how many amateurs would go along with them on something like this after the double-cross they feel they got on incentive licensing. Remember that it was admitted in QST that at least half of the members were opposed to their petition. My estimate would be a lot higher . . . maybe 90%.

Be that as it may, I am tied down to keeping 73 running. I wish that there was some way that I could do something to get the ball rolling with the Institute of Amateur Radio and get started on some of the things that should be done. A few more pages of advertising in 73 would greatly simplify everything here and would take a lot of the pressure off. You can help with this, if you will, by mentioning 73 every time you write to an advertiser and doing everything you can think of to encourage some of the manufacturers and distributors who are not now advertising in 73 to do so. It isn't as if they would be giving to charity for ads in 73 are less than half the cost of ads in QST or CQ and advertiser after advertiser claims that 73 brings excellent results.

Let me know (in letters not requiring answers) what you think. Should I stop worrying about what is going to happen and let things go along without lifting a hand to do what I can? Do you think you can convince the ARRL to get moving? Should we increase the yearly dues of the Institute of Amateur Radio to $10 a year and get things started as best we can? Can you get five other fellows to back you up by becoming members of the Institute? The Institute of Amateur Radio, by the way, is chartered as a non-profit corporation.

Shall we get started?

as a Service Hobby it Provides."

Hobby

The article by Bill Orr in the November issue deserved a bit more attention than the few moments I was able to give it when it came in just before presstime. The Institute of Amateur Radio tour brought me back minutes before the December issue went to press, so I haven't really had a chance to put in my thoughts until right now.

As Bill said, amateur radio does have some serious problems looming ahead of it on the international scene. Certainly every amateur knows that the FCC is able to permit us to operate only in those bands set aside by international agreement for our occupation. If anyone has been reading my editorials for any length of time he knows that our frequencies are coveted by commercial and foreign interests. We came very close to losing significant parts of our choicest bands at Geneva in 1959. Amateurs in Europe and Asia have already lost many of the frequencies that we still are able to use.

This is a time, as Bill says, for evaluation. Let's first take a look at the concept of "service," since Bill says that it is dangerous for us to think of amateur radio as a hobby, but should always think of it in terms of "service." Is it possible that Bill has forgotten all the fun he has had out of amateur radio? Has he forgotten the years he spent DX chasing? The years he spent building equipment? The DX-peditioning, the rag chewing, the experimentation? Has he forgotten that amateur radio has been *fun* for him? Is he trying to say that all this time he has been performing a serious service to his country and nothing else?

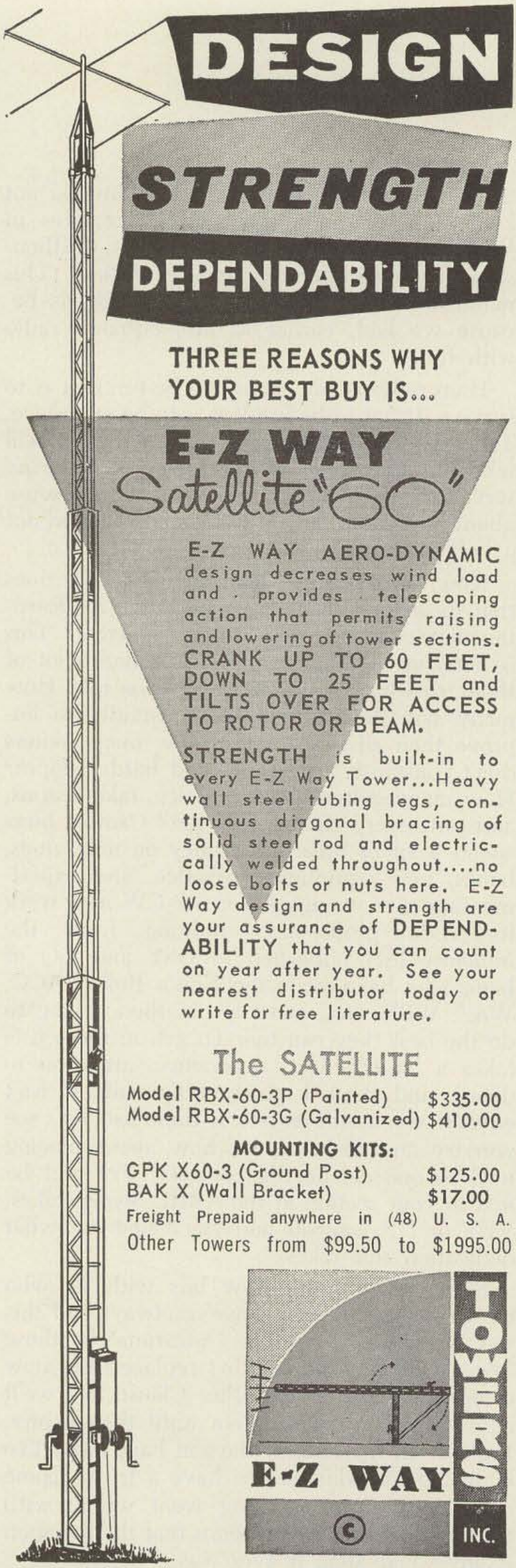
Thick poppycock! (Not sheer).

Bill, and the rest of us, have been active in our HOBBY for all these years because it is *fun*. We have enjoyed it. Few of us have ever found another hobby that was *more* fun. But this in no way detracts from the services that we have performed for our communities, our country and for the world. This has not kept us from springing into action at the first hint of trouble to be ready to provide emergency communications (and *enjoying* doing it). This has not kept us from being so enthused about radio that many of us have decided to make it our life's work, thereby benefitting the electronics industry and our country. This did not keep us from joining the armed services in World War II and providing tens of thousands of radio operators and technicians. This made us all the better at these functions because we had, earlier in life, equated radio with fun.

Ham radio is fun. It *has* to be fun if it is to survive. It *has* to be fun if it is to be of service. Take the fun out of ham radio and you will take the operators out . . . and you have *no* service. So let's stop all this semantic nonsense about ham radio having to be a service and not a hobby.

Now, just because ham radio is fun, does that mean that there is no incentive for learning more, for becoming more proficient? This is not true of other hobbies. I've had a lot of them, so I have some perspective on this. How many skin divers don't try constantly to improve their diving ability? How many skiiers don't constantly try harder and harder slopes? How many golfers don't practice, take lessons, and putt every chance they get? Camera bugs spend a lot of time and money on magazines, books, new equipment, practice, and experimenting. Are we any different? CW men work for code proficiency. Judging from the immense lists published in QST and CQ of hams who have made the Honor Roll, DXCC, WAZ, WPX, etc., hams are in there trying to do the best they can too. To get on these lists takes a lot of effort, experience, attention to detail, and darned good equipment. It isn't easy. If you aren't on one of these lists let's see you try and make it. Or how about placing well in one of the big contests? Try and be first in your section in the ARRL Sweepstakes, VHF or DX contests and you'll find out what dedication this takes.

Sure, we've got a few lids with us who can't replace a fuse, but we've always had this sort of excess baggage. Unfortunately those few old timers who couldn't replace fuses now come under the Grandfather Clause and we'll have to put up with them until they expire. Right from my earliest days in ham radio I've known hams who had to have a friend come over every time anything went wrong with their rig. I don't see any signs that the situation is any worse than it ever was.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Bill goes on to point out some popular lid-isms such as "break-break" and "gimme a clear channel for a phone patch" as proof that we're coming apart at the seams. He should read some of the Old Man's stuff in old QST's. The cry of alarm is as loud today as it was thirty years ago and the little collection of lids go happily on.

I don't know where Bill dug up his expert witness for the ham distributors, but we've got one around here who says, "Sure, I've got a few ham customers who can't change a fuse, but the great majority of them are pretty shrewd chaps who read up carefully on a piece of new gear before they invest and give me little trouble once they've bought. I'm constantly amazed at their ability to second guess the factory engineers."

West coast schools are in trouble too. Back here one well-known educator, also a radio amateur, pointed out, "It has been my experience that radio amateurs are almost invariably ahead of their classmates in courses that require understanding rather than just plain memorization. A great many of the truly remarkable science students I've had were licensed amateurs."

A well-known amateur who has been a project director in a large electronics firm had this to say, "Electronics would not be where it is today in this country if it were not for radio amateurs. I defy anyone to show me an electronics company today that does not have a sizeable number of amateurs on their staff."

It must be admitted that the number of amateurs who are building their own transmitters has dropped off considerably since the day of the MOPA rig and the 6L6 modulated by a 6L6 era. Few amateurs today can hope to build a 200V, or even for that matter do a reasonable job of servicing one. It takes a high degree of knowledge and a lot of expensive test equipment to prepare one to tackle something like that. No wonder a lot of modern equipment has to be professionally serviced.

What then is the role of the amateur in today's technology? Is there anything left for the amateur but plugging in his equipment and going on the air? You bet there is. Ham radio holds more today for the amateur than ever before. In the old days you had your choice of phone of CW. Period. Now we have large groups of amateurs who are actively experimenting and operating with RTTY. These chaps have done much to develope new types of equipment to meet the specialized needs of amateur radio, equipment which is very valuable for commercial and military applications.

We have Ham-TV, though there are only a few hundred actively investigating this new frontier of our hobby. We have the VHF's and UHF's, where the great bulk of the present day home construction and experimentation is going on. Remember that the first working parametric amplifier was used on six meters.

Amateur radio in the United States is a hobby and needs apologize to no one. It has more stature than it ever had before. When we look at the FCC rules we find that we are indeed fulfilling our mandate far better than the amateurs of any other country in the world. We have the only really effective amateur "service" in the world. Is there any legitimate question of stature when our government recognizes us to the extraordinary extent of permitting us to orbit our own satellites? PICON? We are the world's leaders when it comes to PICON. The world would do well to take a close look at our amateur radio rules and see where they can make changes which will encourage their people to become enthused about hamming and bring them all of the benefits which we now have.

Fellow amateurs, I say you should be proud. Ignore those few mental defectives who are spreading their inconsideration on our bands. They are insignificant in the large picture of things. They certainly are not just cause for the furor that we have been subjected to. Ask the old timers about ham radio in the 30's. Ask them how much stature it had then as compared to today. Ask them if they had anyone to compare with Arthur Godfrey, Curtis Lemay, and Butch Griswald as active amateurs. There seems to be a good possibility that we may find ourselves with a president who is a ham. Stature?

OK. So we have the best amateur service in the world, something of which we can really be proud. Does this mean that we must leave it as it is and not try to work out ways to improve our hobby and ourselves? Of course not.

Frankly I was greatly disappointed to see Bill selling ham radio short the way he did. I felt that he was extremely unfair when he resorted to selective quotes from anonymous "experts" to prove his contention that amateur radio is at its lowest ebb and that we should all stand head bowed in shame for our sins. I was very disappointed, more to the point, shocked, to find that he was approving of ARRL's proposal for a return to the old Class A licensing system.

Incentive Licensing

The ARRL has thrown a tremendous work load on the FCC by their hasty petitioning for taking the phone bands away from the General and Conditional licensees. The bulk of the hassle could have much better been worked out through the pages of QST and membership contact with the directors. Now the membership (and everyone else) is suddenly faced with an FCC about to act upon proposed legislation. Petitions and letters are going into the FCC at record volume and you can imagine what the effect has been upon the three fellows who make up the Amateur Division, not to mention the impression all this obviously must make on the FCC Commissioners themselves.

The ARRL's proposal has been countered by many others, some of which seem far more reasonable to me. After reading through some twenty different petitions and taking the best ideas out of the best of them, I'd like to throw this possible solution to the matter at hand up for discussion.

Suppose we establish two separate "Extra" Class licenses, one for phone and one for CW? The present holders of Extra Class licenses would then hold both Phone and CW extras. Present or past holders of First Class Commercial CW licenses plus a General or Conditional license would be eligible for a CW Extra. The exam for the CW Extra would be as strict as the Commercial First Telegraph. The Phone Extra would be available to holders or past holders of First Phone licenses plus a General or Conditional amateur license. The exam for the Phone Extra license would be comparable to the First Phone exam, which, in case you don't know it, is a toughie.

The establishment of Extra Class segments in our bands would provide considerable incentive toward achieving these goals. For instance, the CW Extra could be allocated a twenty kilocycle segment at the bottom end of twenty and forty meters. This would not seriously inconvenience the present users of these CW bands as there would still be adequate frequencies for them. No one would be put off the air. Since these frequencies are important for working DX and contests our future lists of contest winners and Honor Rollers would be largely made up of Extra Class licensees, thereby adding even more stature to the achievement. The phone Extra segments could be from 3750-3800 and 14,-150-14,200 kc, limited to sideband only. I realize that this will raise problems with Canadian amateurs, but perhaps at this time they can join us on an equal footing. Thus no one, again, would be forced off the air, allowing us to have our cake and eat it too, if I may coin a phrase.

This would put far less of a burden on the FCC for it would not bring on anywhere near the mass of examinations that would be called for if all General and Conditional licensees had to take a new exam in order to stay on the air on phone.

As I say, many other ideas have been suggested. I mention this one because it seems to have the most to offer and the least possibility of danger. This could bring about increased occupation of our bands instead of possibly cutting down on our occupancy at this critical point in time. It would also reverse the present depression which is starting to hit our manufacturers and distributors.

I still believe that a better solution is to encourage fellows to improve themselves and correct any difficiencies that we agree should be corrected. It seems to me that we should be able to bring enough pressure to bear to improve the poor operators through articles and editorials in our ham magazines. If we want to present a better image we can do it simply by merely asking everyone to make it his business to correct inconsiderate amateurs instead of just hearing them and grumbling about it privately. If we want fellows to be better qualified technically we can manage this by publishing articles aimed at helping them.

The attitude of trying to get the government or police to force people to do things that they could be induced to do voluntarily does not appeal to me. You must admit that there has been no attempt to correct any of our problems on a voluntary basis.

Just Like Congress

ARRL members who write in to headquarters complaining that RM-499 does not represent their views have been getting letters back pointing out that Congressmen do not go ask their constituents before they vote for a particular piece of legislation, they just vote as they think best. They then go on to say that this is what the ARRL Directors did.

Sure, this is true of the normal work-a-day legislation that Congressmen have to handle. But when something of universal and vital interest comes up you can bet that there will be a referendum. Do you think for one minute that Congress would put through a law taking away all drivers licenses over a three year period unless the holders passed a new and more difficult test, one which included questions on engine theory? The people would rise up in a storm as the amateurs are now rising up.

The ARRL is implying that their RM-499 is merely routine. This is deceitful.

Opposing RM-499

Never before has amateur radio been so split as it is today over ARRL's petition RM-499. Since it is extremely unlikely that amateurs will find much printed in QST in opposition to their petition, it sort of falls on 73 to give the fellows who are in opposition a place to put across their views.

It is expected that the deadline for sending in comments on RM-499 will be extended to January 11th. I hope that you will read the information herein as well as that presented by QST, plus the Bill Orr article in our November 73, and let the FCC know how you feel about the situation. Don't forget the original and 14 copies.

One of the best petitions to the FCC that has come to my attention was the one sent in by Dana Griffin W2AOE. Dana has taken an active interest in the situation and has not only taken the ARRL to task for their petition, but has many interesting ideas to offer as to methods to accomplish the ends that the ARRL claimed to be shooting for. We'll be hearing more from Dana in future issues.

Perhaps I am wrong, but I don't believe that anyone can read the facts of the case against RM-499 and still seriously support it.

PETITION TO DENY REQUESTS FOR RULE AMENDMENTS AND RULE MAKING

This petition is being presented to the Federal Communications Commission by Dana Adams Griffin residing at 139 Beekman Road, City of Summit, Union County, State of New Jersey. Said petitioner holds an Advance Class amateur operator's license and operates his own amateur radio station using the assigned call letters W2AOE.

Your petitioner has held an amateur license since 1920 and has been employed in the electronic's industry in a variety of engineering and management positions since 1922. He testified professionally at the FCC hearings on television allocations in 1950, at the time being a member of the NTSC allocations committee.

He has been a member of the American Radio Relay League for nearly forty years and has been a frequent contributor of articles of a technical nature to the League's publication QST from the early 1930's up to and including this year, as well as in numerous other technical journals since the mid 1920's.

In the matter of so called incentive licensing, the subject under consideration by the Commission in this proceeding, your petitioner is opposed to the adoption of any and all of the so called incentive licensing schemes which have been presented to the Commission for its consideration.

Particular attention is called to the petition filed by the American Radio Relay League of Newington, Connecticut.

It has been the custom for some time for the ARRL to claim it represents more than 80,000 licensed radio

amateurs.

Under ordinary circumstances, there would be no reason to question this statement. However, since the editorial in the February 1963 issue of QST by John Huntoon, General Manager of the ARRL and Editor of the magazine on the subject of so called incentive licensing there has been a continuous uproar of dissent and assent with respect to the imposition of some form of so called incentive licensing. As late as the September 1963 issue of QST, Editor Huntoon admitted the count was still running 50% for and 50% against so called incentive licensing. It is quite obvious that the ARRL does not represent 80,000 odd amateurs in this matter, since half of its members or QST readers are opposed to the scheme.

In order to get at the facts in this matter, it is necessary to examine the first QST editorial on the subject, which appeared in the February 1963 issue of QST.

Editor Huntoon reviewed the history of incentive licensing and noted its demise in 1952 when major changes in Part 12 of Commission's rules were made.

He then stated flatly and without reservation that the "majority of amateurs favor the principle of incentive licensing." He also stated—"there is no longer a target beyond the standard amateur license *(at least none with practical incentives)*.—" This petitioner has added underlining to the above quotation for purposes of emphasis.

It is most important to *note that none of the reasons for the imposition of incentive licensing now put forth by ARRL were even mentioned in this controversial editorial.*

It took many months and many requests for clarification of the ARRL position by this petitioner and others before the ARRL finally put forth a clear cut statement on the ARRL's reasons behind its intention to propose modification of Part 12 of the Commission's rules to include some form of so called incentive licensing. This appeared in the form of an editorial in the September 1963 issue of QST.

Two reasons were given to support the introduction of the ARRL's so called incentive licensing program. That the American amateur must improve his image at home and abroad by drastically reducing technical malpractices of all sorts and conducting his operations in a much higher class manner than he is doing at present.

The net result of these improvements is alleged to be a principal factor in enabling radio amateurs to retain their high frequency bands in the face of determined efforts in the making by some of the other radio services to take them away at the next ITU conference on high frequency allocation. It is interesting to note that no enhancement of the image of c.w. men is contemplated. From an ARRL point of view one would think that no one outside the United States could read the Morse code or analyze a poor telegraph signal. Evidently only fone men indulge in malpractices and bad manners. Therefore, they are the only ones who must be "worked over" into better individuals.

This belated reasoning is open to serious question in the light of A. Prose Walker's article in the October 1963 issue of QST. In this article Mr. Walker, former member of the Commission's staff, explains in great detail the complex requirements for an adequate defense of amateur service HF band assignments at the next ITU HF allocations conference. While an improvement in our domestic methods and manners on both fone and c.w. will be helpful, such improvements are relatively minor factors in the overall requirements to defend the retention of high frequency band assignments now available to the amateur radio service.

Let us turn to the ARRL's so called incentive licensing proposal in the light of its own statements as to the necessity for the changes it proposes.

Throughout this petition, the term "so called incentive licensing" has been used. We contend the ARRL proposal is being presented under false colors. It is actually a "no incentive" re-examination program for fone men who want to operate on the 15, 20, 40 and 75 meter fone bands in the future.

By passing a new examination, fone men will be permitted to operate on the 15, 20, 40 and 75 meter phone bands *with no added privileges or improved operating conditions*. Passing the new examination will permit them to operate just as they are doing at the present time without a single change. Where is the "practical incentive" set forth by Editor Huntoon in February as a reward or incentive?

The answer is obvious and this petition's definition of the ARRL's program is correct. It is a no-incentive program.

From a technical point of view, failure to recommend the elimination of all forms of fone transmission except suppressed carrier single sideband transmission as Australia has already done with its tiny amateur population of less than 5000, provides a clear indication that the ARRL leaders either do not care about or do not recognize the fact that intense QRM (interference) in itself is a major generator of bad practices. QRM caused by excessive population will not go away like a nightmare. Drastic steps are required to alleviate it, the ARRL's "no incentive" re-examination proposal for fone men only cannot conceivably accomplish it.

The effects of overcrowding on human behaviour are easily demonstrated. On the 14th Street bridge in Washington, or the IRT subway in New York, manners are exemplary at 5:00 A.M. and people are quite serene. The situation changes drastically at 5:00 P.M. when overcrowding jams the traffic facilities. The same situation applies on the amateur bands. All is calm at 5:00 A.M., but try your luck on weekends or during the evenings on other days when QRM reaches peak levels. During DX contest periods, the mental state known among hunters as "buck fever" affects the manners of thousands of amateurs adversely.

The imposition of the proposed examination might temporarily reduce the amateur population using fone on these bands. If the examination is stiff enough, thousands of amateurs may fail to qualify, particularly those in the senior citizen class. They will then be deprived of the right to use millions of dollars worth of equipment, except on 10 meters.

Even so, any reduction in actual numbers is highly questionable. The amateur population will rise in 3 years from 270,000 to approximately 350,000 as pointed out in this petitioner's paper "A Survey of Communication Practice on our High Frequency Bands" which appeared in the February and March 1963 issues of QST.

If the novice and general license requirements are made considerably stiffer, we can expect the growth rate to slow down and possibly a better prepared group of novice and general licensees will result. In this respect, this petitioner agrees with ARRL policy in calling for stiffer novice and general license requirements.

This petitioner believes he is on firm ground in stating that no examination conceived by man can prevent technical malpractices of either an accidental or a deliberate nature, or that passing any examination can cause an improvement in personal manners particularly under conditions of stress. If this were possible, we could have all of our citizenry take appropriate tests and then proceed to dismantle our police forces and houses of detention.

What is really needed in our American amateur radio service is a major self-policing effort on the part of a substantial portion of the amateur population. Such a group must help the unwary to stay within bounds and attempt to keep the selfish extroverts in line as well. This suggestion was made to a number of ARRL leaders last March at a special meeting in New York. While received with some initial enthusiasm, it apparently has been dropped.

The ARRL claims the amateur body is self policing. A most casual examination of its numerically insufficient "Official Observer" group, with its postcard reports of violations long after the fact, quickly shows this claim to be false. Better yet, the continually increasing amount of malpractice on the air demonstrates very quickly that the term "self policing" amongst amateurs is a hollow joke. This situation can be corrected without amending the Part 12 rules. A major continuing educational campaign is required.

Now let us turn to the timing schedule proposed by the ARRL. On the one hand, the ARRL leadership frantically calls for immediate improvement of our image at home and abroad. Under their program, they propose to improve it starting in 1965 on the twenty meter band, in 1966 on the 15 and 40 meter bands and in 1967 on the 75 meter band.

Why domestic and foreign impressions of the American amateur are more important on 20 meters in 1965 than

those received on 15, 40 or 75 meters during 1965 is a real mystery to this petitioner. Do our own government officials as well as those overseas have frequency conscious time clocks in their minds which prevent them from hearing nasty things on 15, 40 or 75 meters in 1965? Actually ionospheric propagation being what it is these days, good reception can be obtained on all four bands both here and abroad.

It should be quite clear at this point that the ARRL is proposing a "no incentive" re-examination program for fone men only which will cost the FCC and thousands of individual amateurs hundreds of thousands of dollars to undertake.

The program will go into effect so slowly that even if *any sort of technical examination* could reduce accidental or intentional malpractices, horrible examples of said malpractices will be available for all the world to hear until 1967 on the 75 meter band.

It becomes quite apparent that even if the ARRL program could conceivably work, its timing is far too slow to provide an improved image of the American amateur at home or abroad.

Intensive preparations for the next major ITU conference on HF allocations will start long before 1967 in every country in the world and most impressions of the American amateur will be formed long before that time. In fact, a good many rather permanent impressions undoubtedly already exist both at home and abroad.

The lack of thought, bona fide incentives, provisions for technical advancements in operating practices, improvements in telegraph operations as well as fone operations, and a major self policing effort, all of which are missing in the ARRL proposal, may raise a rhetorical question in the minds of the Commission as to how the ARRL proposal ever was developed and presented to the Commission for serious consideration.

We believe the answer lies in the area of the basic structure of the ARRL and its traditional, outmoded policies in areas involving engineering considerations. Quite properly no one can serve as an officer or member of the Board of Directors of the ARRL who is engaged in the radio business. This is a wise provision to protect the amateur radio service from destruction from within.

What is most unwise is the ARRL's failure since its inception (particularly in the post World War II period) to even hire competent professional help in the complex areas of allocations, frequency utilization long range planning, etc.

Its Board of Directors or its Executive Committee comprised of competent men in many walks of life (except radio communications) prepares its own technically involved plans on a more or less emotional basis with some assistance from its QST publications staff who are also emotionally involved from many standpoints.

It is quite apparent to many thoughtful amateurs experienced in business management, that if you pay for advice prepared by experts in a technical field, any Board of Directors is then in a position to act wisely on a basis of fact, not wishful thinking.

The rejection by the Commission of the subject ARRL proposal and others now before it may have a salutary effect on the future management policies of the ARRL, insofar as its dealings with the Commission are concerned.

The Commission may see future ARRL proposals that include bona fide improvements in the modus operandi of the amateur radio service, which undoubtedly would be most welcome. They have been conspicuous by their absence for many years.

SUMMARY

1. It is the contention of this petitioner that the ARRL proposal and other proposals for various forms of so called incentive licensing, now under consideration by the Commission are misguided efforts to legislate technical competence and/or better manners into the amateur radio service which are doomed to failure.

2. Bona fide self policing of the amateur bands by thousands of qualified amateurs will provide the desired results very rapidly and will not require any change in Part 12 of the Commission's rules.

3. The ARRL request for a special examination for fone men only if implemented, will cost the Commission and thousands of amateurs a great deal of money and will not improve the situation in any manner.

4. The proposed timing of the ARRL program is too late to achieve the desired result, an improved image of the amateur radio services by outsiders listening in on the amateur bands, prior to preparations for the next ITU conference.

5. Lastly the ARRL position is not representative of a majority of amateur opinion in this matter. Indeed, if equal opportunity to present this petition or similar petitions opposing so called incentive licensing to the amateur body had been available, support of the ARRL position would undoubtedly diminish very drastically well below the claimed support at 50% of the amateur population.

For the reasons and facts presented herewith, this petitioner prays that the Federal Communications Commission will deny any and all proposals for incentive licensing under consideration in this proceeding.

They cannot provide the improvement of the image of the American amateur radio service which they purportedly will accomplish. Therefore, they cannot enhance the public interest, convenience or necessity.

Respectfully submitted,
Dana A. Griffin
Petitioner
October 21, 1963

OPPOSITION TO PETITION FOR RULE AMENDMENTS AND RULE MAKING

Preliminary Statement

This Memorandum *in opposition* to the Petition for Rule Amendments and Rule Making of the American Radio Relay League Inc. dated October 3, 1963 (the "League") is being submitted by Harry Balterman, the holder of General Class Amateur Radio License K2BMD (the "Opponent"). In the points to follow, Opponent will demonstrate:

1. The League's proposal is a unilateral, autocratic proposition conceived and proposed in bad faith.

2. The League's proposal will destroy the entire concept of amateur radio.

3. The proposed rule violates Section 9(b) of the Administrative Procedure Act.

4. The proposal of the League will foist upon the taxpayers of the United States the unnecessary and intolerable burden of the costs of re-examination, administration and monitoring.

5. The proposed rule would deprive amateur radio operators of property without due process of law.

6. If incentive licensing is deemed desirable, the Commission should reject the League's proposals and set aside portions of frequencies presently limited to A-1 operation.

POINT I

THE LEAGUE'S PROPOSAL IS A UNILATERAL, AUTOCRATIC PROPOSITION CONCEIVED AND PROPOSED IN BAD FAITH.

The nuclear explosion of "incentive licensing" (which in actuality is an involuntary "restrictive licensing") was triggered by the League in the February, 1963, issue of QST. Upon turning to Page 9 of that issue, Opponent, who has been a licensed radio amateur operator, and a member of the League, since 1952, read that the 1932 regulations requiring a special class of license as a prerequisite to operation on the then newly-established voice bands at 75 and 20 meters originated with the League at the request of *serious phone men who were distressed at the low standards and poor techniques too often employed by some operators at the time.*

He also read that:

"Most amateurs want a return to the incentive system of licensing. They feel that the 1952 action (of abolition of Class A, B and C licenses) was a step backwards. They argue that because there is no longer a target beyond the standard amateur license (at least none with practical incentives), the U. S. licensing system has bred mediocrity and resulted in deterioration of the general level of our technical knowledge. They say too many of today's amateurs are 'plug-in-appliance' operators. They want a return to the principal of special privileges after proof of special ability, a reinstatement of some form of the earlier system—perhaps a modern version of the old Class A examination, bringing it in line with current requirements and techniques."

The following thoughts immediately come to Opponent's mind: Is it not strange that the "*serious* phone men" who were distressed at the alleged low standards and poor techniques employed by operators in 1932—over thirty years ago—are still distressed today! What makes one into a "*serious* phone man"? And what is a "*not serious* phone man"? Who is the arbiter? And who is the teacher! The old timer? The new operator? The 25 year man? The 10 year man? WHO??

It became immediately obvious to Opponent that the League was not really proposing *incentive* licensing but was in reality seeking *special privileges*. Equally obvious was the fact that a red herring and straw man technique of argumentation would be employed. A technique that would have to develop for itself as time went on and according to the exigencies of the opposition.

Continuing to read, your Opponent was startled to read the following statement of the League:

"We feel we can safely affirm that a majority of amateurs favors the principle of incentive licensing."

Further along in the article, Opponent read the following:

"Would a return to restricted phone bands act as a suitable incentive for amateurs to advance technical proficiency? Would it improve the quality of our signals and thus conditions in our bands? Would this upgrading of amateur standards outweigh the inconvenience to Conditional and General licensees who would temporarily be limited to lesser privileges while they study for the additional test? Would the incentive system operate in the best overall interests of amateur radio, transcending the initial injustices it would certainly work upon some of us?"

Having asked these four questions, the League, of course, answered them immediately and said: "We feel the answer in all cases is a definite yes."

The Commission will note that at this point of time, the League was concerned with the following major factors:

1. Technical proficiency
2. Quality of signals
3. Conditions in the bands
4. Special privileges

On February 4, 1963, Opponent wrote to the League and challenged the truth of the statements contained in its article. He charged then, as now, bad faith. He charged then, as now, use of the technique of "the big lie." He demanded to know who polled the amateurs and when. Opponent advised the League that in his opinion the League had no right either morally, ethically or legally to proceed with a proposal to the Federal Communications Commission to institute special privilege licenses unless it took a poll of all of its members and was authorized to file such proposal by a majority vote of the membership. Other amateurs demanded the same thing for they felt that every one had a right to be heard.

The League deliberately, contumaciously and contemptuously failed and refused to conduct a poll of its membership. The determination to petition for a special privilege class of license was made unilaterally by sixteen members of the Board of Directors of the League—and not by the membership!

Opponent complained to the League in February, and complains now, that the League is dominated by, and caters to, a select minority group of old-guard diehards who feel that the airwaves are their exclusive property. Opponent complained then, and complains now, that one of the major objectives of the League's proposal is to eliminate the large group of young people who are on the air today. Opponent is forty-four years of age and received his license when he was thirty-three. He was one of the first of the K calls. At that time, it was his experience that the K calls were shunned by the W calls. It is Opponent's firm belief, and this can be proven, by monitoring the airwaves, that the WA calls and the WB calls of today are met with the same distaste by the "old-timers" as the K calls in 1952 and 1953. Of course the voice bands are crowded. Of course there are plenty of young folks on the air today including *very* young folks. But they have the same American right to be on those airwaves as the 55 or 65 year old man who sits at his super-kilowatt rig and cries and moans and spits about the "good old days." *Opponent is very proud of the amateur license which he holds.* He also believes that he has served the cause of amateur radio well. When the MARS program was active, Opponent, who holds the call AAF2-BMD, was one of the few individuals in the Long Island —New York area authorized by the Pentagon to operate on 14,405 kc in the international MARS net. Hundreds of phone calls were made through the medium of AAF2BMD to all parts of the United States from North Africa, France and the northern-most regions of this hemisphere. Opponent received commendation from the Chief of MARS and other high-ranking officials at the Pentagon for his services as well as countless bits of thanks and appreciation from overseas military personnel and their families at home. These services were rendered willingly, happily and efficiently, despite the fact that Opponent had a K call and despite the fact that Opponent was not a professional electronics engineer.

The League has consistently ignored the demands of membership that a poll be taken. There are approximately 250,000 licensed amateurs in the United States. The League claims membership of approximately 80,000. These 80,000 members have been deliberately and wilfully ignored by the League. Nevertheless the League purports to act as the representative of not only the 80,000 but of all 250,000. This is the epitome of autocracy.

In the March, 1963 issue of QST, the League acknowledged that it had "stirred up quite a lively discussion." Nevertheless, it clearly and unequivocally stated that the decision as to whether or not a proposal to change the licensing system should be presented to the FCC will be made only by the Board of Directors of the League. The League thus admittedly becomes the VOICE OF AUTOCRACY and the "General Motors" of the amateur society—deciding that what is good for it is good for all amateurs!

The League, however, in March, already realized that in order to put across its proposal, it would have to embark upon a course of conduct that would embrace confusion as its password for it is far easier to confound confusion than to convince by clear and understandable logic. Apparently, the writer for the League must have read Mark Twain where it was said: "The more you explain it, the more I don't understand it." (See also *SEC* v. *Chenery Corp.*, 332 U. S. 194, 214.)

Thus, let us see what the League began to do:

In February, it spoke of advancing technical proficiency; improving the quality of signals; improving conditions in our bands; and special privileges. In March, it states that it is a misconception to believe that a principal objective is to reduce the number of amateurs using certain voice bands and thus the QRM. It states further that neither is the proposal proposed exclusively as a remedy for poor signals and bad manners on the air. It admits that a higher grade of license will not automatically make a gentleman of a licensee. It does not, of course, admit that the same degree of technical proficiency should be required for a c.w. operator as a phone operator. It focuses its attention upon voice operation and not code operation.

Is it not peculiar? Is it not amazing? The League never discusses the c.w. operator. Voice operation is treated as a privilege and c.w. operation apparently is relegated to the haven of mediocrity (to use the League's own words). Technical proficiency, quality of signals, conditions in the bands and special privileges can be

safely ignored in the c.w. portions of the spectrum. Why? How come? Does the c.w. operator wield a mace?

In the same issue of QST (March, 1963), the League clearly and unequivocally states that amateur radio is a HOBBY. Thus, it states in the 10th paragraph of its editorial on Page 10 as follows:

> "It is the duty of the League to push for improvement in all the various phases and interests of amateur radio—public-service potential, operating ability, courtesy, technical proficiency and just plain enjoyment of *our hobby,* to name a few. The restricted voice band proposal is primarily aimed at just one of those —technical proficiency. Its purpose is to spur the amateur body with a challenge to improve personal ability in the technical radio field, which is certainly in the national interest, and to do so by providing an incentive, which does not now exist, in the form of *special privileges.*" (emphasis added)

Note please the use of the word HOBBY. It is the next to the last time that the League will admit that amateur radio can be deemed a hobby. Also please note the "special privileges" concept.

The March issue of QST determines that it will endeavor to camouflage the "special privilege" approach by embarking upon an educational program with respect to effective spectrum use. Opponent is in full accord with the recommendations and objectives of the League insofar as effective spectrum use is concerned. Opponent is certain that all amateurs are in accord with the recommendations as set forth at Page 65 of the March issue of QST. But that is not the issue now before the Commission. Opponent resents, decries and protests this deliberate attempt to confuse which is also present in the very petition for rule making that has been presented to the Commission. Thus, the Commission itself is being presented with the same article, in substance, as appeared in the March, 1963 issue of QST. Opponent refers to the initial material under the heading "The Proposed Solution" contained in the League's petition. Opponent states that the League's objective of efficient spectrum use is in fact the solution to the complained of problem. Restrictive or Special Privilege licensing is not the solution.

In June, 1963, QST announced to the amateur fraternity that posterity will record the 1963 meeting of the Board of Directors of the League as one of the most significant in the history of the League. That is a bit pompous, it is not?

Opponent earnestly requests the Commission to ask the League for copies of the June, 1963 QST so that it can read the remarkable dissertation upon the League's virtues and achievements written by the League itself.

The League has now become the protector of the public interest, convenience and necessity; it has assumed for itself the task of proving to the world that there is justification of continued retention of amateur frequencies; it has become the interpreter of the rules of the Commission; it has become the voice of persons "highly placed in the communications regulatory field"; it pontificates that operating pleasure alone is no justification for the continuance of amateur radio; it transforms amateur radio from a hobby into a profession; it becomes the seer and portender of doom and advises that if amateur radio continues as a hobby, it will soon disappear; it assumes the task of Government; and it announces that it will make amateurs absolutely "superb." *Sic transit gloria mundi!*

The League, in the same article, warns that its Board of Directors has faced a real challenge at its 1963 meeting; pridefully advises that the course of future events has now been charted; states that we should be proud of them; and commends the Board members to posterity!

The announced goals of the League now become (in March):

1. Increased amateur technical proficiency
2. More efficient use of amateur frequencies
3. More effective performance in the public interest, convenience and necessity

Having been subjected to devastating attack by its membership, the League, in its July issue of QST, states that its position "was adopted by the Board of Directors, a group of sixteen mature and capable amateurs elected by the membership to formulate ARRL policy." 16 people! 16 mature and capable people! These 16 have presumed to legislate for 250,000! The League states that "the Board's action, knowing beforehand of the furor it would create, took considerable courage." Opponent states that it took considerable gall!

By September of 1963, the League was visited with the light of genius. The "Society of Sixteen" now issues its holy writ that the trouble with amateurs is that they assume that the FCC has exclusive jurisdiction over frequency usage in the United States whereas the fact is that frequencies are allocated at international radio conferences and the FCC can make domestic assignments only within the basic pattern of international agreements.

We now witness the circle going full round. The League now states that its objective "simply stated is a program to preserve amateur frequency bands" (Page 9, September QST).

A contemporary author has written:

Christopher Robin goes
Hoppity, hoppity
Hoppity, hoppity, hop.
Whenever I tell him
Politely to stop it, he
Says he can't possibly stop.

This is the League! This is the "Society of Sixteen." They just cannot stop! They are on an electronic merry-go-round and will not get off! For months, reason after reason has been advanced for their actions and now, in September, 1963, they state that they only want to preserve amateur frequency bands. Opponent commends the editorial at Page 9 of September QST to the Commission. All amateurs want to preserve our amateur frequency bands. All amateurs desire to join together in a common effort to preserve and improve radio. But the League is wrong. There is not only one answer—their answer. That is Khrushchev speaking. In the United States, we believe in democracy. In the United States, we acknowledge that there can be more than one side to an issue. We do not state: "Do it my way or else do not do it!"

Apropos of this subject, Opponent desires to bring the attention of the Commission to an amusing incident which occurred on the air only recently. In discussing the subject matter of the League's proposal with an "old timer"—a two-letter call man in Florida—Opponent was told that if he did not like the League's proposal, he should surrender his ticket and get off the air. This is typical of the League's old-guard. "If you don't agree with us—get off the air." Opponent has no intention of getting off the air. Opponent is an attorney-at-law and has been since 1947. He is fully capable of passing any radio theory examination that may be put before him. However, he wishes to point out that when there are changes in medicine, doctors are not required to take new examinations and when there are changes in law, lawyers are not required to take new bar examinations.

In October, the League, without the authorization of its membership, presented the subject petition. The petition is, like all of Gaul, divided into three parts:

1. The alleged raison d'etre of amateurs.
2. The alleged problem.
3. The alleged solution.

The petition will be carefully analyzed in the succeeding point. Suffice it to say at this time, however, that in the November, 1963 issue of QST, the League is still trying to think of why it filed the petition. Thus, in the first paragraph of its editorial on Page 9 of that issue, the League states that in accordance with instructions of its Board of Directors (the "Society of Sixteen"), the petition has been filed and:

> "The purpose is to provide additional self-training goals, and thus to strengthen the position of the amateur radio service in both domestic and international affairs."

The League, however, does not appear to be quite convinced as to why the petition has been filed (and to this day, your Opponent does not know why either) for only two short paragraphs away, the League finds it necessary to again state the purpose and sets forth:

> "Its purpose is to attain a substantially higher average technical level and thus improve the stature of the amateur service."

Upon examination of all of the material published in

QST upon the subject, it seems apparent to Opponent that each of the "sixteen mature and capable amateurs" who have determined to chart the course of 250,000 other amateurs have each had an opportunity to write their own editorial because none of the editorials ever say the same thing!

The League, in its new-found role of prosecutor, defender, judge and jury, demonstrates in this self-same November, 1963 issue of QST that, in its opinion, it is already a foregone conclusion that the proposal will be adopted in substance by this Commission. Thus at Page 10 of the November QST, the League states as follows:

> "The next move is up to FCC. The Commission might issue a notice of proposed rule making embodying the suggested changes, or it might modify them as its judgement dictates. Before any substantative changes are made final, of course, administrative procedure requires that all interested parties be given an opportunity to express their views."

The Commission will note that not for a moment does the League consider the possibility that the Commission may *not* issue a notice of proposed rule making. It takes it for granted that the Commission will, in fact, issue a notice of proposed rule making although it does acknowledge that the League's proposals might be modified. One might think this attitude incredible were it not for the incredible fact that the League is presenting a proposal affecting its entire membership without polling its membership and without authority.

Will this Commission allow itself to be dictated to by the autocratic fiat of the "Society of Sixteen"? Or will this Commission recognize the League's ill-founded, ill-conceived proposal for what it really is?

POINT II

THE LEAGUE'S PROPOSAL WILL DESTROY THE ENTIRE CONCEPT OF AMATEUR RADIO.

The term "amateur" is defined by most dictionaries as meaning the cultivation of a particular pursuit, study or science, from taste, without pursuing it professionally.

The League's proposal admittedly is pointed toward making the amateur radio operator into an "electronics expert." (See Page 9 of June, 1963 QST.)

Let us now examine the petition itself. The petition is divided into three categories:

Topic A: The alleged reasons for being of the amateur radio service.

Topic B: The alleged immediate problem.

Topic C: The alleged solution.

Topic A

The material set forth by the League under Topic A is nothing more than a bout with semantics. The semantologists in the League's "Society of Sixteen" have conducted a contest amongst themselves and the winner that has emerged is the proponent of the doctrine of "Service." It is now determined to varnish deception by means of disingenuous emphasis on the word "service." This quixotic tilting with windmills takes place so as to destroy any concept of amateur radio as a "hobby." The propostion is advanced that if amateur radio were to be deemed a hobby, it could not justify its existence. This fallacious and specious argument is a straw man and a red herring. It is a sham resort to a "fear" type of argument that distorts reality and substitutes in its stead pontification—nothing more than a form of catharsis.

The reason why amateur radio as well as other divisions or departments or arms of radio frequency communications is termed a "service" is best known to the Commission. While Opponent is the proud possessor of an amateur radio license and treats amateur radio with the highest regard, Opponent submits that amateur radio stands on its own feet and does not have to be justified by calling it a "form of service, both to the public and to the nation." The fear technique employed by the League in its Topic A is the culmination of the League's tortuous striving to find a justification for its proposal. Opponent's POINT I has demonstrated that the League has hopped from foot to foot in trying to justify the submission of its proposal. The straw man and red herring of "service" should be recognized for what it is and should need no further comment.

Topic B

The material that is set forth by the League under its Topic B is a classic classroom example of spurious conjecture. A hypothetical question that assumes a state of facts not shown by the evidence to exist. Thus, the League artificially *creates* two problems that have no foundation in fact.

Problem No. 1

Once an amateur has obtained his General or Conditional Class license, he no longer has any practical or meaningful incentive to increase his technical knowledge and proficiency and earn a higher grade of license.

This is purely *post hoc ergo propter hoc* reasoning—an utterly illogical form of reasoning! It is sheer drivel! It is sheer nonsense! It is the same as saying that a lawyer stops reading law journals and law books once he becomes a lawyer and a doctor stops reading medical journals and medical reports once he becomes a doctor. A lawyer cannot earn a higher grade of license. A doctor cannot earn a higher grade of license (specialization is not a state granted license). An engineer, once he becomes an engineer, cannot earn a higher grade of license. A certified public accountant once he becomes a CPA cannot earn a higher grade of certification. But law, medicine, engineering and accountancy do not come to an end because there is no incentive of higher grades of licenses! But sixteen membrs of an autocratic socity have determined for themselves that no amateur radio operator will study or have any concern with radio once he gets his General Class license because he has no incentive of a higher grade of license.

The answer to the League's supposititious Problem No. 1 is simply—POPPYCOCK!

Problem No. 2

The League is greatly concerned because the design and construction of manufactured equipment is excellent and the operation thereof is simple. Ergo, says the League, it no longer is necessary for an amateur using such equipment to have practical knowledge sufficient to construct his own equipment or to even fully understand the circuitry and theory of operation of the manufactured equipment.

It is now, says the League, open season on manufactured equipment. Back to the days of Guglielmo Marconi! Damn the transistor! Full speed back to the spark gap!

There can be only one answer to this bit of nonsensicality—this burlesque of truth. One word: *HUMBUG!*

Topic C

Opponent does not have any dispute with the first five full paragraphs appearing in the petition under the topic "The Proposed Solution." Opponent does, however, violently dispute all of the material contained in the sixth and following paragraphs under this topic commencing with the words "After extensive study, etc." Opponent states that in his opinion the answer of the League is not the answer. He states unequivocally that it has not been demonstrated that the public interest, convenience and necessity will best be served by the adoption of the League's proposal!

Opponent submits that the League's proposal is, in effect, punishment where no crime or offense has been committed. Sixteen people have indicted and convicted 250,000. High crimes and treason (indolence and ineptitude) are charged. High crimes and treason are proven. But the defendant is neither identified nor in the dock. The League indicts; the League prosecutes; the League defends; the League judges; the League convicts. Heresy has been pursued by the Society of Sixteen—tried—convicted! Off the air is the verdict of the Inquisition.

Let us examine what would happen if the League's proposal were to be adopted. Only a limited number of possibilities necessarily exist:

1. Most amateurs will take the examination.*
2. Few amateurs will take the examination.*
3. Most of the amateurs who take the examination will pass.
4. Few of the amateurs who take the examination will pass.

If eventualities 1 and 3 come to pass, amateur radio will be exactly the same as it is today and nothing will have been accomplished. We will all be back to the exact same point of starting. The self-same cry will then be raised. No incentive because we have all passed. We

* It is reasonable to eliminate the category of *all* amateurs and of *none*

have nothing to look forward to because we have all passed. What then? A new rule making procedure? A new punishment? Ad infinitum!

If eventualities 1 and 4, or 2 and 3, or 2 and 4 come to pass, the high frequency bands will be practically deserted and amateur radio will, in effect, have received a setback from which it will not easily recover. Why? Because then it will be claimed that amateur radio does not need the frequencies assigned to it because they are not in use. Imagine then the weeping, wailing and gnashing of teeth at the international conferences when the member countries contend that the United States does not need any reservation of high frequencies for amateurs since they are not in use. What then will it avail us to claim that the reason why they are not in use is because we require our amateurs to be electronics experts before they can use those frequencies. The 15, 20, 40 and 75 meter bands are precious privileges. We can only keep them through utilization. We will lose them through non-utilization. We will lose them if an amateur has to be a professional before he can operate on those bands. We agree with the League that retention of frequencies is of inestimable value. We do not, however, want to risk the loss of our frequencies—as does the Society of Sixteen. We desire that all amateurs who hold the General Class license be permitted to continue to use those privileges which have been granted to them by the United States Government. We desire that the goodwill that is presently being spread throughout the world by the U. S. radio amateur be permitted to continue. We desire that the amateur "voice of America" continue to be heard. The favorable image of the American "ham" (if you please) should be allowed to continue to penetrate the world—on phone—as well as on c.w. We do not hold to the proposed deprivation of the privileges to really *serve* the public interest—to really *serve* our country. We do not hold to a suppression of Americanism. Our record is clear and convincing. The light of true American democracy has been spread by amateur radio. It should not be circumscribed. It should not be extinguished.

POINT III

THE PROPOSED RULE VIOLATES SECTION 9(b) OF THE ADMINISTRATIVE PROCEDURE ACT.

If the petition of the League is approved by the Commission and a new rule adopted by the Commission taking away radio-telephone privileges of the General Class license in the 15, 20, 40 and 75 meter bands, such rule will be, in effect, a withdrawal or a partial suspension, revocation or annulment of a license already granted. Section 9(b) of the Administrative Procedure Act provides that except in cases of willfullness or those in which public health, interest or safety requires otherwise, no withdrawal, suspension, revocation or annulment of any license shall be lawful unless, prior to the institution of agency proceedings therefor, facts or conditions which may warrant such action shall have been called to the attention of the licensee by the agency in writing and the licensee shall have been granted the opportunity to demonstrate or achieve compliance with all lawful requirements.

The Senate Committee report on the Administrative Procedure Act clearly indicates that the standard of *public interest* referred to means a situation requiring immediate action. Obviously no such public interest as would meet the required test has been shown here to exist.

It is submitted that the proposal of the League, if adopted as a rule, would amount to a sanction; that no cause for such sanction has been shown to the Commission; that no facts or conduct which may warrant the revocation of voice privileges already granted have been shown to the Commission; and that, accordingly, there is no power in law to take away such privilege.

Furthermore, if authority in law be deemed to exist, then, and in such event, facts or conduct which may warrant the contemplated action by the Commission must be called to the attention of each and every General Class licensee by the Commission and each and every holder of a General Class license must be granted the opportunity to demonstrate or achieve compliance with all lawful requirements.

But no facts or conduct can in actuality be called to the attention of a holder of a General Class license because no fact has occurred, and no conduct has taken place, which could warrant the contemplated action other than the fact that the Commission might have adopted an *ex post facto* rule. The proposed rule, therefore, becomes, *ipso facto*, violative of Section 9(b) of the Administrative Procedure Act.

POINT IV

THE PROPOSAL OF THE LEAGUE WILL FOIST UPON THE TAXPAYERS OF THE UNITED STATES THE UNNECESSARY AND INTOLERABLE BURDEN OF THE COSTS OF RE-EXAMINATION, ADMINISTRATION AND MONITORING.

Since there are approximately 250,000 amateurs, it can be reasonably anticipated that if the proposal were to be adopted as a rule of the Commission, and if the bulk of such amateurs were to take the examination, the costs to the Government would range from $10 to $100 per person.

This cost estimate is based upon man-hours involved in devising the examination; man-hours involved in giving the examination; man-hours involved in marking the examination; man-hours involved in re-examinations of those who fail the first time; man-hours involved in mailing notice of passing and/or failing, as the case may be; man-hours involved in mailing new licenses; innumerable other man-hour items, including general administrative costs and costs of monitoring as well as printing and similar costs.

Opponent firmly believes that the cost to the United States Government of the League's proposal will easily range between $2,500,000 and $25,000,000. An expenditure of this magnitude should be clearly submitted to Congress for approval and should not be undertaken by the Commission at this time.

POINT V

THE PROPOSED RULE WOULD DEPRIVE AMATEUR RADIO OPERATORS OF PROPERTY WITHOUT DUE PROCESS OF LAW.

It is an elementary proposition of law that governmental restriction of use of property must have as its purpose the protection of public health, morals, safety, order or general welfare. Otherwise such restriction is oppressive, destructive and violative of due process of law.

General Class licensees have, in reliance upon the license already granted to them, and in reliance upon the privileges afforded to them by such license, expended considerable sums of money in connection with the acquisition of transmitting and receiving equipment. The investment of many individual amateurs who fall within this category exceeds $1,000. To be summarily and arbitrarily deprived of the use of this equipment by a restriction on the use of their license absent a showing that such restriction is designed to protect the public health, morals, safety, order or general welfare, is oppressive and destructive and, accordingly, a deprivation of property without due process of law.

POINT VI

IF INCENTIVE LICENSING IS DEEMED DESIRABLE, THE COMMISSION SHOULD REJECT THE LEAGUE'S PROPOSALS AND SET ASIDE PORTIONS OF FREQUENCIES PRESENTLY LIMITED TO A-1 OPERATION.

Opponent has heretofore stated that it is quite strange that at no time has the League made any reference to c.w. operation. Opponent will not attempt to endeavor to determine why this is so. Opponent submits, however, that if, in fact, it is deemed desirable to have some form of special privilege license, then the Commission should establish special privilege phone bands other than those phone bands now in existence. The Commission should allocate portions of frequencies that are presently limited to c.w. operation for holders of special class radio telephone licenses. This then would be incentive! This then would not be punishment! This then would provide stimulation for further study if such further study is necessary! This then would compel those amateurs who are not otherwise interested in the make-up of their equipment to see what makes it tick! This then would be fair; not unreasonable; and not oppressive.

POINT VII

CONCLUSION

1. The petition of the League should be denied in each and every respect by reason of the fact that the public interest, convenience and necessity will not be served by the adoption of the proposals contained in such petition.

2. In the event the Commission determines that the concept of incentive licensing should be adopted, then, and in such event, the Commission should not adopt the rules proposed by the League but should adopt rules pro-

viding for a special class of radio telephone license to be issued only after special examination, which special class of license would permit A-3 operation in portions of the 15, 20, 40 and 75 meter bands presently reserved for A-1 operation.

Respectfully submitted,
Harry Balterman
Attorney and Counsellor-at-law

In addition to the many petitions sent in to the FCC there were innumerable letters mailed to the ARRL. The following is typical:

W—2—S—H—Z
3 No. Belmont Circle
Oneonta, New York

November 12, 1963

Board of Directors
American Radio Relay League, Inc.
225 Main St.
Newington 11, Conn.

Gentlemen:

By way of introduction: I am 50 years of age, and have been licensed since 1955. (W8MTZ, KZ5HE, W2SHZ) I am employed as a television repairman by a company of national scope, and was an electronics technician during WW II and the Korean conflict. I have had little formal education in this field.

I am not, by definition, a "balanced amateur," in that my main interest in amateur radio is the contacting of as many different countries as possible with moderate power (one hundred to two hundred watts). I prefer CW to phone, and most of my activity has been via this medium. However, I handled much overseas traffic after WW II, when such traffic seemed to have a real meaning; I have done a modicum of VHF work; I belong to AREC and RACES; I hold a RCC certificate, and adhere to the principles of RCC; I am frequently an officer in the local radio club; until the past year my equipment has been home-made, generally modified from an existing design, to fit my needs, except for a BC 312E which has been the station receiver for seventeen years. (That too has been extensively rebuilt.) In the past year I purchased a compact band-switching transmitter which incorporates DSB and AM as well as CW, and dispensed with the old rig. I passed the Advanced Class License examination when its provisions meant nothing to me, and was an early recipient of the Extra Class Ticket, passing these tests, as Hilary may have said, "because they were there."

So much for myself—who are you? Do you belong to the worthy group described in the following editorial?

Representative Government

I asked my father once why the Puritans left a perfectly comfortable country to come over to the New World with its savage Indians and hard life. His answer was, "In order that they might be able to worship God according to the dictates of their own conscience—and prevent others from doing the same."

I have thought about that many times in A.R.R.L. affairs. It gets one down to the fundamentals of government. It's a good thing to get down to fundamentals every once in a while. It keeps one from getting off the road and becoming lost.

Our A.R.R.L. government is strictly Representative. Every two years our members in each of our fourteen divisions elect a man to represent them. These fourteen men are the directors of the A.R.R.L. What the majority of them vote to do is what the majority of the country thinks is best, and it is done.

These men select a President, a Vice President, a Secretary, a Treasurer and a Communications Manager. They allow the President to vote to break a tie and they allow the Vice President to vote. All the other officers are hired men and they have no vote. The directors may hire or fire them at will. In other words, the directors, representing the entire country, are the rulers of the A.R.R.L. It is typically American.

The President may howl his head off for something. Unless he can convince a majority of the other fifteen directors that it is best for A.R.R.L. as a whole, he is turned down.

A Director may argue and threaten for something that his Division wants. Unless he can convince a majority of the other fifteen directors that it is best for the A.R.R.L. as a whole, he and his Division get turned down.

In other words, no man nor no local group of men can impose their will upon the whole. Nobody can "prevent others from doing the same."

That's Representative Government. This history of human affairs has shown that it's the kind of government that succeeds.

This editorial appeared in QST for November, 1927. It was written by the founder and, at that time, President of the League, Hiram Percy Maxim, who must be convoluting in his grave like a dervish if any of these suppositions and accusations presently being bandied are true.

What of these accusations? I assume your collective ear has been close enough to the ground to hear of that newsletter which says some mighty un-nice things about you. Sorting out the chaff of that diatribe I concluded that there was enough smoke to indicate some degree of combustion. My first reaction was that there could be no basis of fact behind such statements, and I expected to see a law suit filed in due order. I have watched for two months for some action to be taken.

Gentlement; I don't feel that a situation like this comes in the category of a small dog snapping at the big boy's heels. If there is no reason to doubt the integrity of the Board of Directors, a reassuring statement should be issued, and the veracity of the allegations in the Doyle papers should be firmly disclaimed. If, on the other hand, Mr. Evans is rattling your skeleton, you should let your constituents know what measures you are taking to prevent such a practice from recurring.

The matter of Incentive, or, as some say, Restrictive Licensing seems to have launched a contraversy which overshadows any of the modern day magillas. I did not take part in the Spark vs CW strife, so cannot speak with authority, but I wonder if that schism was more pronounced than that which splits our ranks today.

Personally, as an amateur, it makes little difference to me whether or not Incentive Licensing is brought about. I'll pass the test and operate in the band of my choice. I may have to cross into the ELECTRONIC GHETTO this proposal will create in order to contact some of my friends, but I expect that discomfort to be balanced by the pleasure of operating in bands which have been cleared of all the "undesirables."

You are not, however, pushing this change to produce such results. Do I conform to any of your objectives? As for my technical ability, I am sure it will not be enhanced by association with others of my ilk. As for the great discoveries made by amateurs in the past, they might seem to parallel the great explorations made when man's knowledge of geography was more limited. Our "Electronic Astronauts" are few, and Incentive Licensing will not increase their numbers.

Will Incentive Licensing make me more a gentleman on the air? I think not. Our fathers could not legislate temperance, we can not legislate morality, and you, gentlemen, will not legislate courtesy.

What of the Public Interest? Will membership in AREC/RACES be a prerequisite to the issuance of this license? Will cancellation of privileges follow a failure to make BPL so many times a year? This too cannot be legislated. There will always be a hard core group of hams dedicated to the public interest while the chips are UP, and, as in time of war, there will be a large majority of hams pursuing their hobby, as a reservoir of

untrained personnel who will serve when the public interest demands it.

At times I deplore the dearth of home-built equipment in the shacks I visit. Many hams wouldn't know the type of tube in the final stage of their transmitters, and haven't the slightest idea of the correct method of adjusting a BFO for optimum CW reception. Reading that their rigs match fifty to six hundred ohms, and noting that a folded dipole presents a feedline impedance of three hundred ohms, they ground one side of the ribbon and feed the other from the coax output. This arrangement gets out swell, and until the first O.O. card arrives, they don't question the reason it gets out.

Perhaps this fault in our system could be legislated, but not at the Extra Class Level. If a prospective licensee had to submit a schematic of his complete station as a part of his examination, and were compelled to operate a home-made station for the first year of his license term, he would be better equipped to understand what goes on behind the shiny panel of that store-bought rig to which he aspires.

You warn us that in a couple of years we will have to face, across a conference table, a horde of new nations, hungry for broadcast frequencies, caring not a whit for amateur radio. So far as I have read, you have failed to convince us that what we do with the amateur service in this country will be any way affect their decisions.

ow was this matter of Incentive Licensing brought about? I have heard many complaints that not enough notice was given the amateur body to allow comments to be made. I read the "It Seems to Us" editorial in June QST, and the Highlights of the Board Meeting, and could not disapprove, in principle, with the stated objectives. It seemed as if my Extra Class License might at last bear some fruit, and I thought of how it was when we had Class A and Class B. After all, A PORTION OF THE HIGH FREQUENCY BANDS would be a suitable reward for a ham interested enough in furthering his understanding of "the state of the art" to pass an examination qualifying him for this reward.

Technically you stated this correctly—10 and 160 do constitute a portion of the high frequency bands, but I'll wager that a vast majority of those who bothered to think it over came up with the wishful thinking that you meant A PORTION OF *EACH* OF THE HIGH FREQUENCY BANDS.

Ten and One-Sixty indeed! If I were devoid of technical knowledge, from having been able to memorize the answers to questions on various examinations—a fault of the scope of the examinations, not of the examinee—if I were what Wayne Green terms an AO (Appliance Operator), I would seek a new and less complicated hobby. I fear that will be the result of this proposal, along with such fringe deficits as a loss of membership in the League, loss of business to manufacturers, and, in direct opposition to your stated objectives, a loss of activity in the public interest.

I hold little brief for the Conditionals, feeling that this class of license has been widely abused in the past. I know of those who would drive one hundred fifty miles for a shot at a deer, but would not drive eighty miles to take the General Class examination.

May I touch upon the matter of representation? I would not know Mr. Crossley if he knocked at my door. I imagine that, under the system as it was set up years ago, he is doing as well as could be expected at the job of representing this division. Perhops forty years ago a director could sample the feelings of a large portion of his division, but such is not the case today. I understand that a return of eight per cent is considered good for a questionnaire. That is a fault of our way of life. Wayne Green has proposed a grass roots system of communications which has possibilities of merit. *73* for September, 1963 outlines his idea, and I would suggest that you explore a bit along this line, and come up with an idea which would permit Mr. Crossley to be apprised of my feelings on League legislation before he casts his vote.

On the other aspect of representation, I have never felt that the League could truly state that it represents its claimed percentage of the amateur ranks, I am sure that, to many, membership means little more than a convenient Christmas present for the XYL to give, and I feel that if you were to include on the subscription form a statement such as:

I do (do not) designate the A.R.R.L. as my lobbying agent before the F.C.C.

you would know better exactly where you stand.

If, in closing, I may generalize, I am, gentlemen, disappointed, but not disheartened. I would be the first to shout the praises of all the League has done for me in the past, and I shall be equally vociferous in demanding that your thinking be cleansed of the "CW Forever" ideas, and directed towards thoughts as modern-day as is our shiny new Headquarters building. I shall not resign from the League, if only for the fact that my conscience would not allow me to criticize you in this manner, were I outside the fold. I ask only that you: 1. Assure me that T.O.M. rests in peace; 2. Review this matter of Incentive Licensing before we become unable to present a united front; 3. Develop a more progressive method of feeling my pulse.

H. E. Eddy W2SHZ

Procedure for Filing

If you are interested in letting the FCC know how you feel about things the process for filing is not really difficult. First write your letter or petition. Write this carefully, use a dictionary. Be sure that you make all the points you intend to in your letter. Refer the FCC to RM-499, the League petition.

The next step is to prepare this letter and about twenty copies. The easiest way to do this is to find someone or a company with a duplicating machine of any sort . . . or a nearby print shop with a mimeo or small offset press. They'll give you the right masters to type on. Double space it, and leave generous margins.

Once you have your twenty copies send one to the ARRL, Newington, Conn., one to their council, Robert Booth Jr., 1735 DeSales St., Washington 36, D. C., one signed original with the notation (notarized) that copies have been sent to ARRL and council and 14 copies to the FCC, Amateur Division, Washington 25, D. C. You might send one to me for my files.

Reciprocation

Our reciprocation bill was passed by the Senate and now is up before the House as HR-7309 (nice number). The House will be arguing about all sorts of stuff so it is up to us to lean on them with all of the pressure we can muster. Write to Representative Oren Harris, Chairman of the House Commerce Committee requesting an early hearing and favorable action on HR-7309. Send a copy of your letter or post cards to your own representative in Washington. Let's back up Barry Goldwater and the other sponsors of this bill and get it made into law. Amateurs of all countries are the best peace agents in the world; many foreign countries have extended operating privileges to U. S. amateurs; let's be fair about this and take a giant step forward. Don't put this one off or leave it for the other guy, take a hand yourself in moving amateur radio ahead.

(W2NSD continued on page 70)

AOC*

SINGLE SIDEBAND FILTERS

- 9 mc center frequency
- Bandpass 6 db 3 kc (approximate)

ACF-2 Two-crystal filter circuit using low impedance link input and 2K resistive output load. Unwanted sideband rejection greater than 30 db. Mounting space 1½". **$9.95**

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ACF-6 Six-crystal filter circuit using nominal 600 ohm input and output. Unwanted sideband rejection greater than 55 db. Mounting space 3". **$27.95**

MATCHING OSCILLATOR CRYSTALS for the ACF filter series. Recommended for use in OS-4 oscillator.
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Special AOC case for mounting filter plates. Contains case hardware and input-output terminals. **$5.50**

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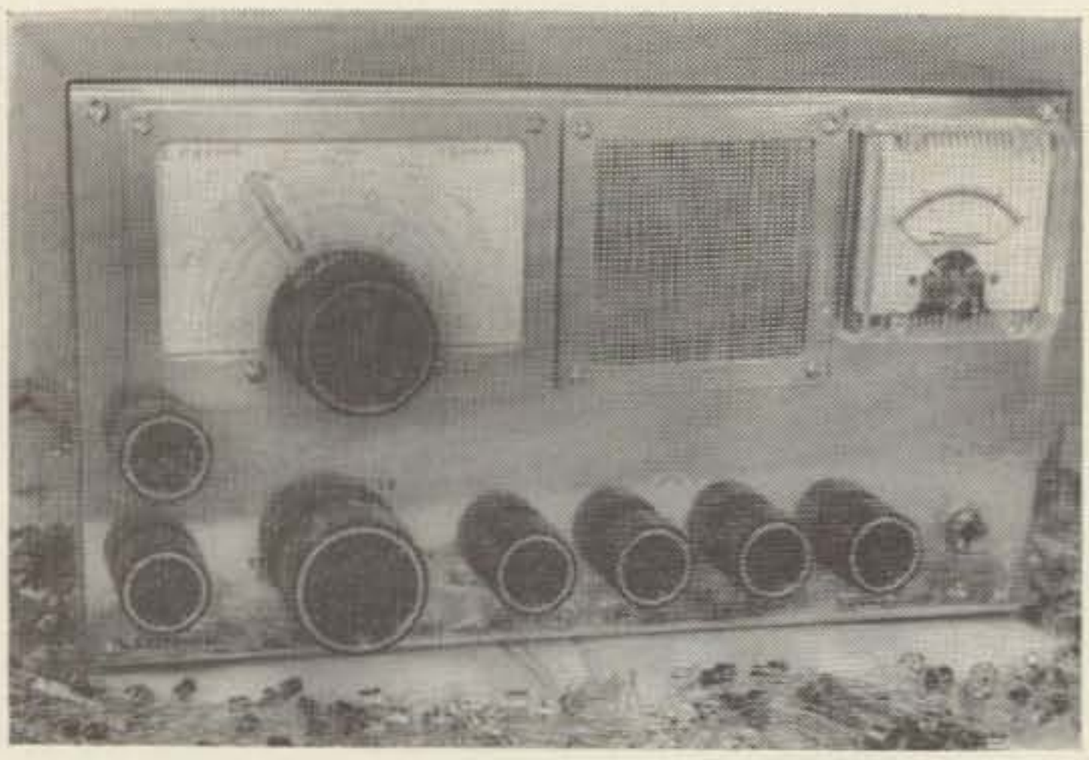

Eugene Franke W3HKX
734 Colebrook Rd.
Philadelphia, Pa.

A High Quality, Transistorized,

Communications Receiver

Transistorized communications equipment is becoming increasingly popular; however, the information available for building high quality receivers is scarce. It is possible to build transistorized equipment with performance comparable to that of its vacuum tube counterpart.

The dual conversion receiver described herein has the performance characteristics of a high-priced vacuum tube receiver. The receiver covers the amateur bands between 3.5 and 54 mc. Composite *agc*[1], which is used in this receiver, offers distortion free performance and better overload performance than any other system of *agc* presently used with transistors.

Other notable features of this receiver are: one micro-volt signal produces a 20 db or better signal-to-noise ratio on all bands; positive adjustable squelch is offered without sacrificing performance; the second *if* employs ceramic transfilters; voltage variable capacitors are used for fine tuning of the high frequency oscillator and bfo; the audio system delivers over one watt of undistorted output.

The small size and low power requirements make this an ideal receiver for both fixed station and mobile operation. The current drawn from a 12.6 v supply is: 16 ma when squelch is applied, 20 ma when headphones are used, 24 to 30 ma for low audio levels from the speaker, and up to 90 ma at maximum volume. The receiver operates on any external supply from 11 to 28 volts, ac or dc, or 110 volts ac.

RF, Mixer, and HF Oscillator Stages

The rf stage was designed so it could easily be adjusted for tracking with the oscillator throughout each amateur band. Capacitive dividers are used with the input and output coils for impedance matching. This method of impedance matching does not offer optimum gain at all frequenices covered but since the transistor has ample gain, the ease of construction and alignment is well worth the sacrifice in gain.

For high sensitivity at high frequency, a high gain transistor is used in the rf stage. Because a high gain transistor is used, degenerating resistors, placed in series with the collector coils, are needed to eliminate the possibility of spurious oscillations which may appear at lower frequencies. A 39 ohm re-

Fig. 1, pages 20 and 21

(Text continues on page 22)

C_1, C_2, C_3, C_4—See table 1
C_{A1}, C_{A2}, C_{A3}—3 Section variable 5-17 pf per section
L_1, L_2, L_3—See table 1
S_1—5 pole 6 position ceramic switch
S_2—2 pole 3 position switch
S_3—DPST switch (mounted on audio control)
T_1, T_2—11 uh, pri 34 turns #32 wire center tapped, sec 4 turns #22 on ¼ in. ceramic slug tuned coil form.
T_3—455 kc if transformer (Philco 32-4738-4)
T_4, T_6—455 kc if transformer (Philco 32-4738-2)
T_5—10 uh, pri 31 turns #32, sec 1 turn #18
T_7—pri 500 ohms, sec 500 ohms ct., (Lafayette AR162)
T_8—pri 350 ohms ct., sec 3.2 ohms, (X-5076 Columbus Process Co., Columbus, Indiana)
Resistances are in ohms.
Capacitances are in pf unless otherwise indicated.

INTRODUCING THE NEW SWAN-TCU

TRANSMITTER CONTROL UNIT

COMPANION FOR YOUR SW-240

EXTERNAL VFO—PROVIDES FOR SEPARATE TRANSMIT-RECEIVE FREQUENCY CONTROL.

- Complete coverage of 20, 40, 75, and 80 meters.
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- Operates directly from Transceiver supply. No additional power supply is required. Those who now own an SW-240 and AC supply need to buy only the Swan-TCU.
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complete with connectors and installation kit for use with all SW-240s.

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THE FABULOUS SW-240 TRANSCEIVER

240 watts PEP input. High frequency crystal lattice filter. Precision tuning mechanism. Exceptional frequency stability. Receiver sensitivity better than one microvolt.
Automatic gain control.
Break-in CW operation.
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Provides both opposite sideband and AM receive position. **$18**

SW-117AC Power Supply With Matching Cabinet.
With 5x7 speaker and phone jack. **$95**

SW-12DC Power Supply for mobile operation.
Has pre-wired cables and installation hardware. **$115**

NOW A NEW SWAN AC POWER SUPPLY—THE SW-117B
Designed to fit inside the Swan TCU cabinet or may be used separately to power the SW-240.

Includes top and bottom covers and rubber feet. **$75**

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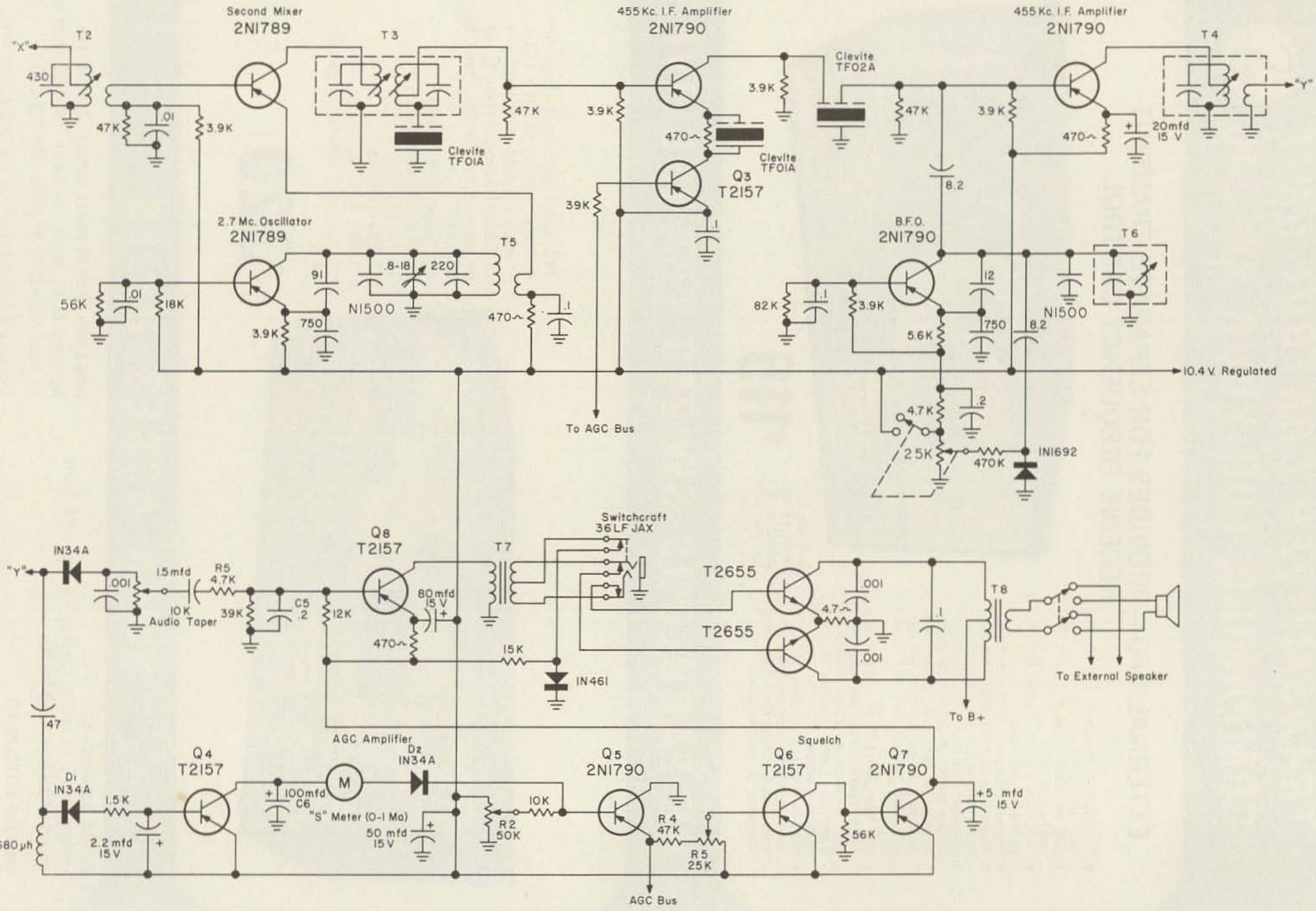
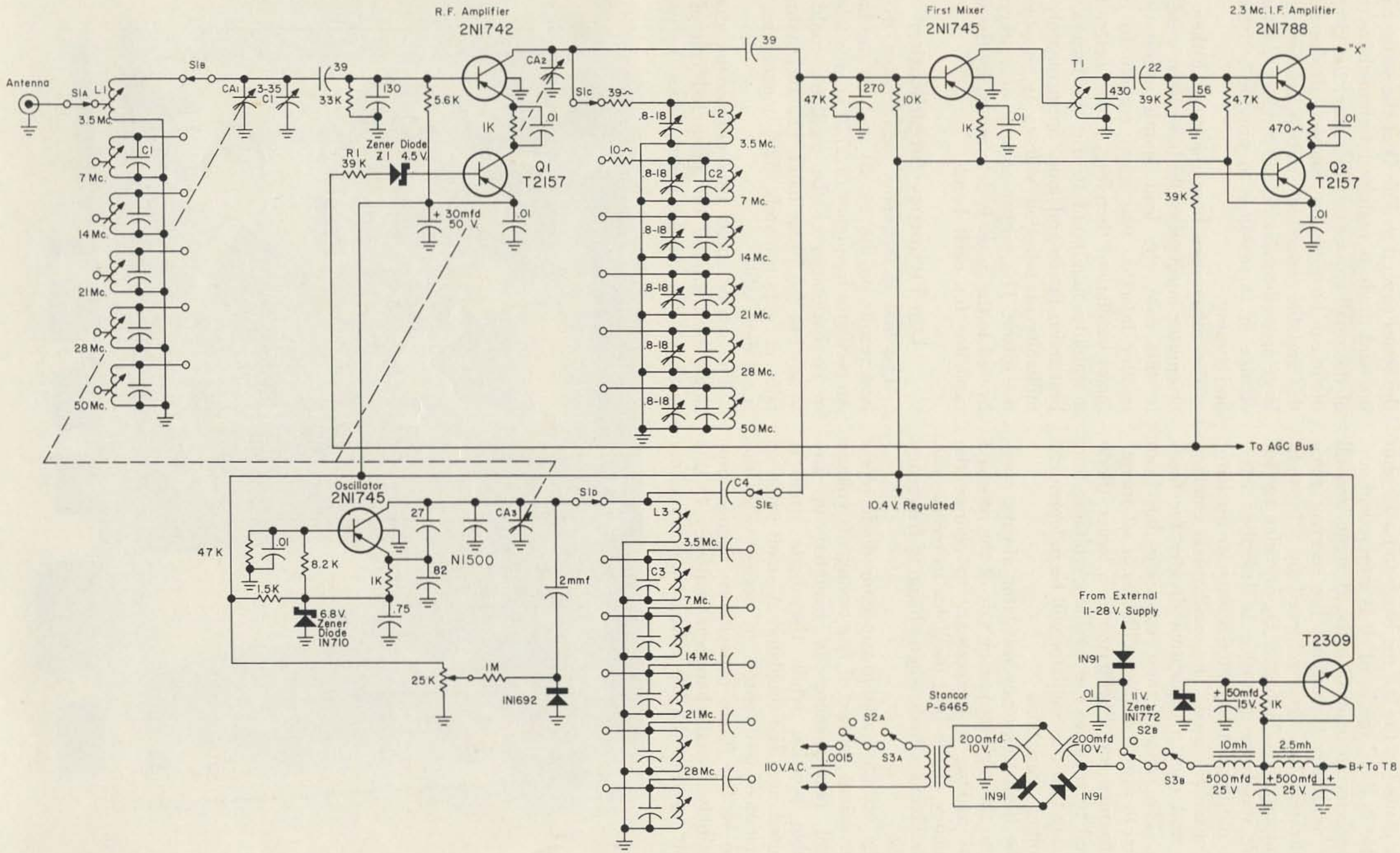

Second Mixer
2N1789
T2
T3
"X"
430
47K
.01
3.9K
Clevite TF01A
47K
455Kc. I.F. Amplifier
2N1790
3.9K
Clevite TF02A
470~
Clevite TF01A
Q3
T2157
39K
.1
47K
455Kc. I.F. Amplifier
2N1790
T4
3.9K
470~
20mfd 15 V
"Y"
8.2
2.7 Mc. Oscillator
2N1789
T5
56K
.01
18K
91
.8-18
220
N1500
3.9K
750
470~
.1
B.F.O.
2N1790
T6
82K
.1
3.9K
12
750
5.6K
8.2
N1500
10.4 V. Regulated
To AGC Bus
4.7K
.2
25K
470K
IN1692
Switchcraft
36LF JAX
Q8
T2157
T7
IN34A
"Y"
.001
1.5mfd
R5
4.7K
10K
Audio Taper
39K
C5
.2
12K
80mfd
15 V
470~
15K
IN461
T2655
T2655
.001
4.7~
.001
.1
T8
To External Speaker
To B+
47
AGC Amplifier
Squelch
Q4
T2157
D1
IN34A
1.5K
680 µh
2.2 mfd
15 V
100mfd
C6
M
D2
IN34A
"S" Meter (0-1 Ma)
50 mfd
15 V
10K
R2
50K
Q5
2N1790
R4
47K
R5
25K
Q6
T2157
56K
Q7
2N1790
+5 mfd
15 V
AGC Bus

FIGURE 1


R.F. Amplifier
2N1742
First Mixer
2N1745
2.3 Mc. I.F. Amplifier
2N1788
Antenna
S1A
L1
3.5 Mc.
7 Mc.
14 Mc.
21 Mc.
28 Mc.
50 Mc.
C1
S1B
CA1
3-35
C1
39
33K
130
5.6K
CA2
1K
.01
Q1
T2157
Zener Diode
R1
39K
Z1 4.5 V.
+ 30mfd
50 V.
.01
S1C
39
10
.8-18
L2
C2
47K
270
10K
1K
.01
T1
430
22
39K
56
4.7K
470
.01
Q2
T2157
39K
.01
"X"
To AGC Bus
Oscillator
2N1745
27
CA3
S1D
C4
S1E
10.4 V. Regulated
47K
.01
8.2K
1K
82
N1500
1.5K
.75
6.8 V.
Zener
Diode
IN710
2mmf
25K
1M
IN1692
L3
C3
2mmf
From External
11-28 V. Supply
IN91
T2309
Stancor
P-6465
S2A
S3A
.0015
110 V.A.C.
200mfd
10V.
200mfd
10V.
IN91
IN91
.01
11 V.
Zener
IN1772
S2B
S3B
+ 50mfd
15V.
1K
10mh
2.5mh
500mfd
25 V.
+500mfd
25 V.
B+ To T8

sistor is used in the 3.5 mc band and a 10 ohm resistor in the 7 mc band. It is impractical and unnecessary to neutralize the rf stage and all other amplifiers throughout the receiver since stabilization has been achieved by mismatching impedances. Transistor Q_1 provides *agc* for the rf stage; its operation is described later.

To minimize interaction, a separate oscillator and mixer are used. The oscillator is common base and uses a capacitive divider for feedback. The ratio of these capacities has been chosen to assure stable oscillation at all operating frequencies. Furthermore, a zener diode is used to regulate the oscillator voltage, thus ensuring that the oscillator will be independent of voltage variations.

The high frequency oscillator always operates on the high frequency side of the received signal making it unnecessary to change the frequency of the beat oscillator to receive single sideband signals when changing frequency bands.

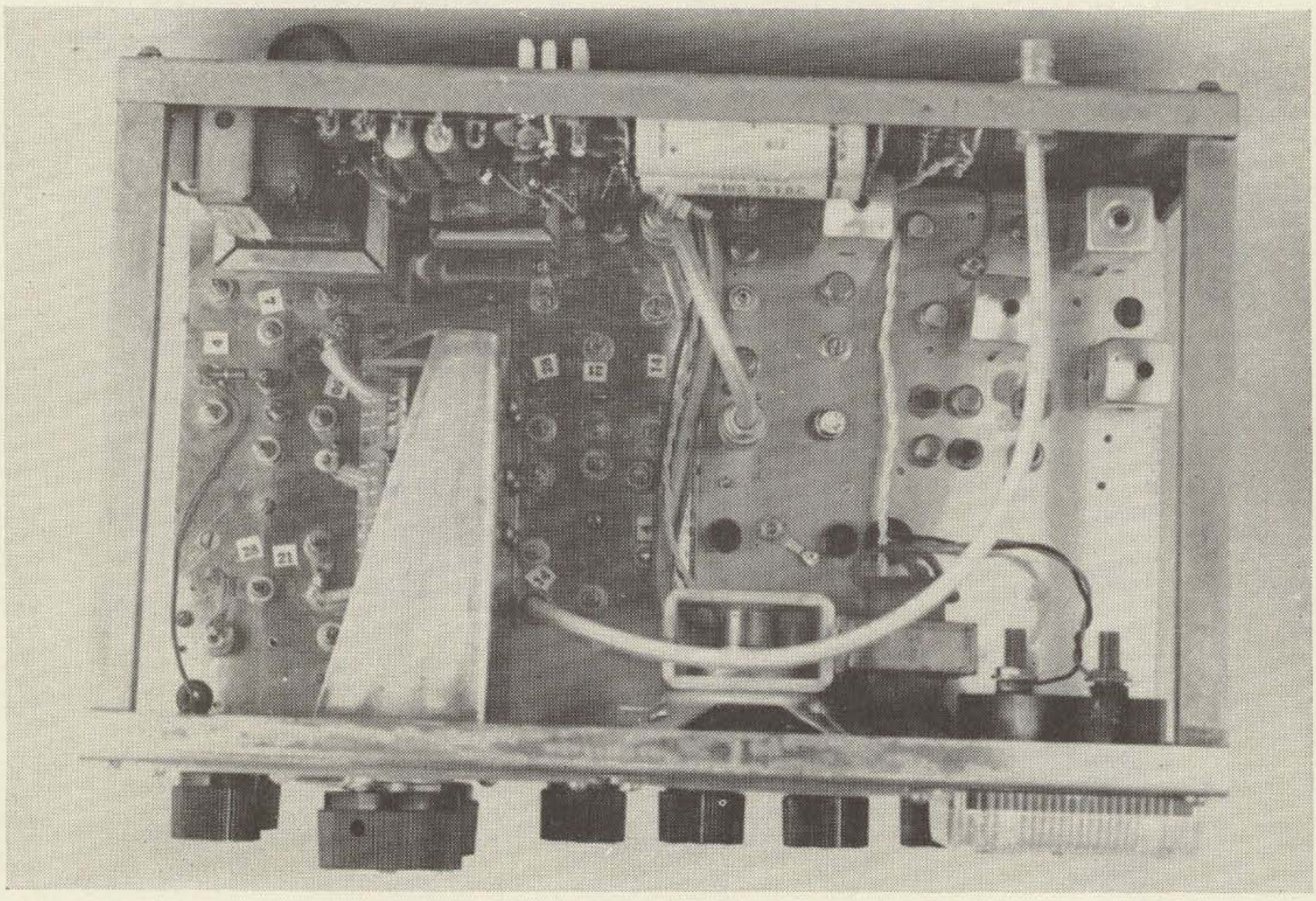
The voltage variable capacitor diode offers a convenient method of fine tuning. Its voltage control potentiometer is mounted in any suitable position while the diode itself is mounted near the oscillator. A small value of capacitance is inserted in series with the diode so the diode capacitance change produces only a small change in frequency. In this circuit, most of the RF voltage appears across the series capacitor. The Q of the series capacitor and diode is mainly determined by the Q of the small capacitor. Therefore, the Q of the diode can be quite low. Since all diodes exhibit this variable capacitance action, an inexpensive large area silicon diode will produce a sufficient change in capacitance to provide satisfactory fine tuning.

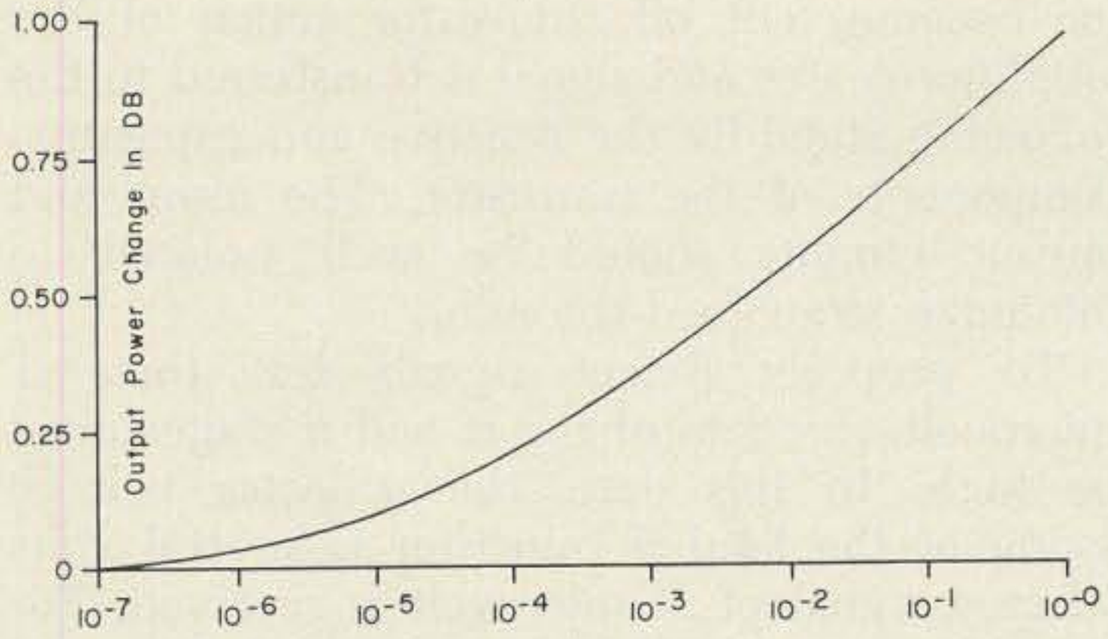
The mixer uses base injection. Either base or emitter injection could have been used, but in this case, the lead length necessary for emitter injection was great enough to cause mixer oscillation; therefore, it was better from a stability standpoint to use the former. For best noise figure and gain, approximately 150 millivolts of injection voltage is supplied to the mixer. The proper amount of voltage delivered to the mixer is determined by the series capacitor for each band.

Low Frequency Amplification

The first *if* frequency was chosen to give best results on the 14, 21 and 28 mc bands. An oscillator frequency of 2770 kc was selected so no harmonics of the oscillator could fall in any but the 50 mc band. The 19th harmonic falls at approximately 52.6 megacycles but is not detectable.

The second mixer uses emitter injection. A single turn around the grounded end of the oscillator coil couples energy from the oscilla-





Input Voltage Plotted Against Output Power
For 30 Percent Modulated 14Mc Signal

FIGURE 2

tor. This link is loosely placed so it can be adjusted to give 150 millivolts of injection.

The second *if* uses a ceramic filter in place of the conventional *if* transformer. This filter requires less space than an *if* transformer and can be mounted more easily.

The bfo transformer uses only the primary winding of a regular *if* transformer. An external capacitive divider is used to provide oscillator feedback. Although resonance can normally be obtained with this added capacitance it may be necessary to remove the internal 220 pf capacitor and resonate the winding with external capacitance.

AGC

One of the problems with transistorized communication equipment is the difficulty encountered in providing automatic gain control. One method presently used is reverse *agc*. Reverse *agc* is accomplished by varying the bias to decrease collector current and thus reduce the gain. The major problem with reverse *agc* is that considerable distortion is introduced as the collector current approaches cutoff. Overload performance is very poor also. Due to the non-linearities of the base emitter diode, the voltage swing to the base should be much less than .1 volt to prevent extreme overload. Another method of *agc* is forward *agc*, but since this method is effective only at frequencies on the 6 db/octave slope of the transistor power gain curve, it cannot be used in this receiver so its operation will not be discussed here.

Composite *agc*[1], which is used in this receiver, does not have the frequency limitations of forward *agc* nor the distortion of reverse *agc*. Another desirable feature is the high input voltage overload characteristic. This technique of *agc* will be discussed in detail.

Transistors Q_1, Q_2 and Q_3 are *agc* control

[1] E. Franke, "AGC Design for Wide-Range Inputs," Electronic Design, PP 102-105, Nov. 8, 1962.

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COMMUNICATION ANTENNAS

BEAMS High Forward Gain

Rugged, Lightweight, and real performers. Booms 1" aluminum tubing, elements $\frac{3}{16}$" aluminum rod preassembled on booms. Reddi Match for direct 52 ohm feed. Add on stacking kits available for dual and quad arrays.

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MOBILE HALOS: Aluminum construction; machined hardware; Reddi Match for 52 or 72 ohm direct feed. 2 meter. Dual halo two bands one 52 ohm feed line.
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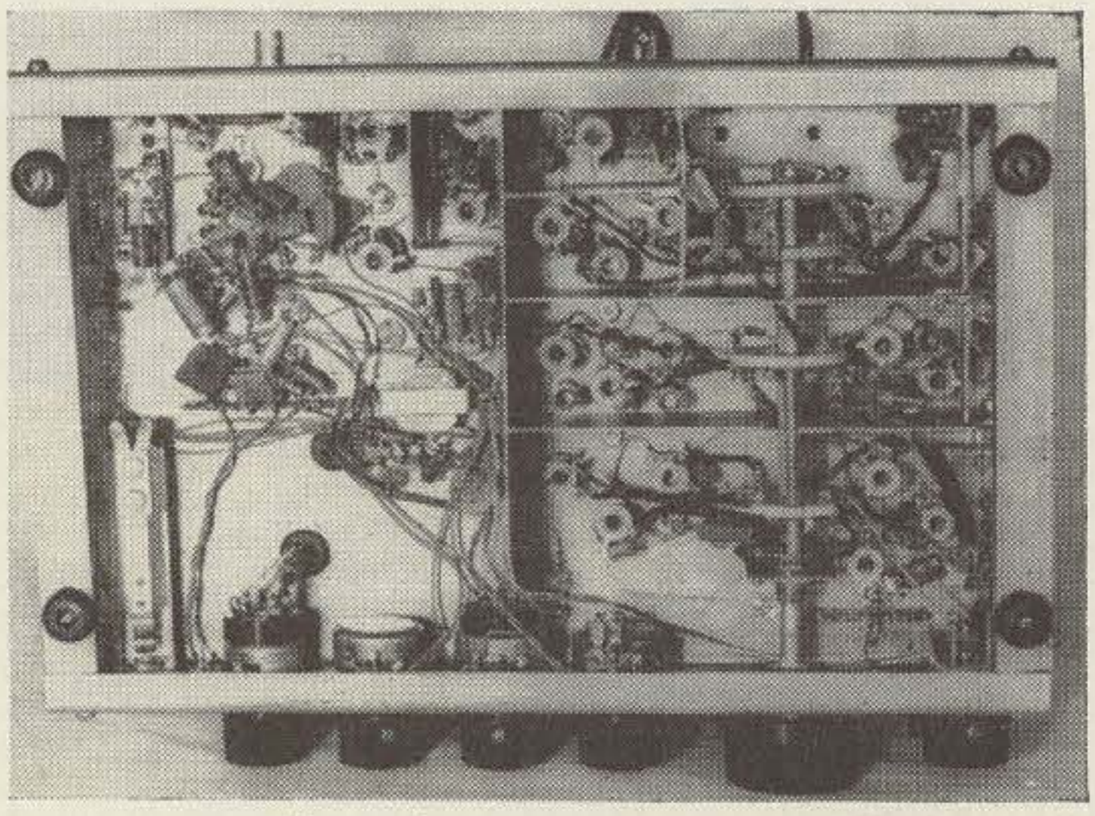

transistors. They function as a variable impedance in each amplifier emitter circuit. As the base current of the control transistor is varied, its collector impedance also varies. When the base current is high, the transistor is saturated and the collector to emitter impedance is approximately 25 ohms; thus, the amplifier transistor operates in the normal manner. When the base current of the control transistor is decreased its collector impedance rises and this rising impedance in the amplifier emitter circuit causes degeneration. When the control transistor becomes cut off, its collector impedance approaches 100,000 ohms. The amplifier emitter impedance will then be much greater than its collector impedance; therefore, most of the input signal will now appear across this high impedance. For this reason the input voltage is no longer limited by the transistor base-emitter diode. The amplifier collector current also becomes very low, causing a loss of gain. Because the high impedance is present in the amplifier emitter circuit, the signal is not distorted at low collector current. Due to degeneration, the benefits of reverse *agc* are realized without the distortion normally associated with it. When the control transistor becomes cut off, transistor action of the amplifier ceases and signal is transferred to the following stage by the resistive and capacitive components of the transistor. The input and output circuits should be well isolated to minimize stray feed-through.

To properly detect signals less than .1 microvolt, the gain of the rf and *if* stages must be high. In this case, the collector voltage swing of the final *if* transistor is several volts when a signal of .1 microvolt is received. For the receiver to handle an input signal of several volts, the overall receiver gain must be reduced approximately 140 db. To prevent overloading, *agc* was applied to three stages, thus providing ample control.

Composite *agc* offers greater gain reduction per stage and higher overload voltage handling capabilities than any other method of *agc* presently used with transistors. The gain of the 2.3 mc *if* can be reduced by 65 db. A 27 volt peak to peak signal can be applied to the base of the 2.3 mc *if* transistor before overload distortion occurs. The gain reduction of the *rf* stage is approximately 55 db on all bands.

The *agc* amplifier is a high gain dc amplifier, consisting of transistors Q_4 and Q_5, which is used to amplify the output of the *agc* diode D_1. This amplifier provides automatic gain control at any setting of the manual *rf* gain control. The necessity for this is that manual gain control is needed in receiving single sideband and in reducing certain types of interference. It may sometimes be desirable to tune for only strong signals, in which case the receiver gain can be low so most of the background noise is eliminated while tuning. When strong signals are encountered under these conditions, it is undesirable to have a considerable change in output. This method of *agc* insures that the receiver will not become overloaded

Table I

Band MC	L_1, L_2	L_3	C_1 pf	C_2 pf	C_3 pf	C_4 pf
3.5	40 μh 70 turns #32 tapped at 10 t	16 μh 40 turns #32				
7	3.1 μh 25 turns #26 tapped at 5 t	1.7 μh 16 turns #26	62	82	130	1
14	0.61 μh 10 turns #26 tapped at 2 t	0.32 μh 7 turns #26	130	130	200	3
21	0.22 μh 5.5 turns #24 tapped at 1 t	0.15 μh 4 turns #24	200	180	220	12
28	0.32 μh 7 turns #24 tapped at 1 t	0.20 μh 5 turns #24	30	30	56	12
50	0.15 μh 4 turns #20 tapped at 1 t	0.12 μh 3.5 turns #20	5	5	18	15

All coils close wound Formvar wire on ¼ inch ceramic coil forms.
L_1 tapped at indicated turns from grounded end.
L_2 same as L_1 except no tap.
Capacitances in pf, silver micas.

YOU CAN'T OPERATE A KILOWATT

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"An amateur transmitter operating with a power input exceeding 900 watts to the plate circuit shall provide means of accurately measuring the plate power input." (FCC Regulations)

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- Power packed performance on SSB, CW and AM. 1500W PEP input; 1 KW CW input
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HXL-1 control circuitry is designed for virtually all existing transceivers and exciters — and is obviously a perfect match — both physically and electrically to the fabulous HX-50 SSB Exciter. A husky, conservatively rated *built-in* power supply imposes no "warning" restrictions or critical time limits on holding down the key — this is POWER — conservatively rated to give you a booming DX signal.

Let the FCC be your guide — *try* and *buy* the linear that matches their most stringent specifications. Complete technical information is available on request — or you can see it at one of the more than 400 Authorized Hammarlund Distributors. There's one near you.

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and is accomplished in the following manner: When the signal is not large enough to make diode D_1 and transistor Q_4 conduct, the voltage on the *agc* bus line is determined solely by the setting of the manual gain control, R_2. This voltage determines the receiver gain. If the signal becomes great enough for diode D_1 and transistor Q_4 to conduct, diode D_2 also conducts and the voltage on the *agc* bus line is altered to prevent receiver overloading. A meter in series with the collector of Q_4 is used to indicate the relative signal strength of the received signals. This meter should be calibrated with the *rf* gain control R_2 set for maximum gain (the most negative or ground position). In this position, maximum *agc* is applied to the amplifiers.

The gain control is applied to several stages to provide the best compromise among noise performance, cross modulation, and overload characteristics. To obtain good noise performance the gain of the *rf* stage should be high when weak signals are received. To avoid overloading other stages, the gain of the *rf* stage must be reduced as the signal increases. AGC should not be applied to the *rf* stage until the signal is great enough for good noise performance but it must be applied before overloading occurs in any stage. Specificially, *agc* of the *rf* stage should be delayed until the input signal is several microvolts.

The zener diode Z_1 in the base lead of the *agc* control transistor of the *rf* amplifier is used to provide delayed *agc* to this stage. When no signal is present, the *agc* bus voltage is approximately 10 volts. This voltage can be decreased to 6 volts before the gain of the *rf* stage is effected. As the voltage is further decreased the gain decreases quite rapidly until at 4.5 volts the control transistor becomes cut off. The cutoff voltage is dependent upon the breakdown characteristics of the zener diode. The amount of delay can be controlled by resistor R_1 and the zener diode Z_1 used in this circuit. At maximum input signal the minimum voltage on the *agc* bus line is established by the characteristics of the transistors in the *if* section. The additional voltage drop across the zener diode insures cutoff of the control transistor in the *rf* stage, thereby allowing it to handle higher voltage input signals.

The output power versus input voltage of this receiver is shown in Fig. 2. The output power is relatively constant for an input voltage variation of 140 db.

The time constant of the *agc* circuit can be changed by changing the value of capacitor C_6. The time constant will be longer as the value of this capacitor is increased.

Composite *agc* may be used with transistor types other than the ones used here. The main characteristics the *agc* control transistor should have are low saturation resistance when the transistor is on, a high voltage breakdown, and low voltage when it is off.

For those individuals not interested in composite *agc*, the receiver can be modified for reverse *agc*. The bias resistors of the *agc*'d transistors that are connected to the positive supply are removed and connected to the emitter of Q_5. The emitters of the *agc*'d transistors are then returned directly to the positive supply.

Squelch

Positive squelch is provided by transistors Q_6 and Q_7. Squelch is accomplished by removing the bias and supply voltage from the driver stage and the bias voltage from the output stage when a level of *agc* voltage, determined by the setting of R_3, is reached. Without Resistor R_4, the squelch control R_3 can be adjusted to provide positive squelch action at any input signal level from less than .1 μv to several volts. R_4 is used to allow easier adjustment of the squelch control but limits the maximum squelch level to approximately 50 millivolts (i.e., 60 db over S_9). Positive on-off action will occur with less than a 10% change in input signal regardless of the setting of the squelch control. For the receiver to remain on continuously, R_3 should be adjusted to the most positive position. The significant features of this squelch system are no sacrifice of receiver sensitivity and unlimited squelch level adjustment.

A germanium transistor may be used for Q_8 but the leakage current of these transistors is usually high and audio will leak through this stage. Q_6 may be replaced with a germanium transistor but temperature stability is sacrificed.

Audio

Transistor Q_8 is used as an audio amplifier for headphones and becomes the driver transistor for the output stage. The headphone jack removes the bias from the output stage when a plug is inserted. Headphones with an impedance of 600 ohms to 10,000 ohms may be used.

Since no essential speech information is contained above 4 kc it is undesirable, from a noise standpoint, to pass high frequencies through the amplifier. Resistor R_5 and capacitor C_5 are used to limit the high frequency response of the amplifier. The gain of the amplifier begins to decrease rapidly at 3.5 kc. The emitter of Q_8 is bypassed in the manner indicated to minimize hum. If the emitter were not properly bypassed, hum would be intro-

duced into this stage when the ac supply is used. This point is mentioned because individuals often incorrectly bypass the emitter of audio transistors and incorrectly assume the transistor is at fault for causing hum.

The silicon NPN audio output transistors do not run away thermally when delivering several watts of audio. It is unnecessary to use heat sinks on these transistors at this power level. If audio distortion is noticed, the last stage should be checked to make certain the transistors used can handle the voltage encountered. They must be capable of handling a voltage that is twice the supply voltage. If clipping of the audio is noticed, another set of transistors, which have higher breakdown voltage, should be substituted or transistors such as the T2309 or 2N2379 should be used. However, the T2655 (a matched pair) will usually prove quite satisfactory for supply voltages less than 20 volts.

Power Supply

The 6.3 volt filament transformer was chosen because of its small size. The supply output voltage is approximately 18 volts. A zener diode and transistor are used to provide a 10.4 volt regulated supply. Additional filtering is used for the audio output stage so no audio feedback occurs. The diode in series with the external supply protects the receiver in the event that incorrect polarity voltage is applied to the terminals. This diode is used as a rectifier when the supplied voltage is ac. The internal power supply has the added capability of supplying power for external high frequency converters used with this receiver.

Construction Considerations

Although this receiver is housed in a solid brass cabinet built by the author, it can be constructed in any available 6 x 11 x 7 cabinet. If the speaker were not mounted on the front panel, a smaller cabinet could have been used. To facilitate construction, the receiver was built on two chassis. One chassis contains the *rf* amplifier, oscillator, and mixer. The other contains the remaining circuitry.

The main tuning capacitor must be securely fastened to the chassis and mounted in a position to minimize feedback from the speaker. The shielding around the high frequency oscillator is rigid so that vibrations cannot cause frequency shift. Dual switch contacts are used for the band switch to insure positive contact.

The circuits used have been thoroughly tested. The receiver will operate with a 5 volt supply, though not quite as well. Although in several cases circuit functions could have been combined to lessen the number of components, no compromise was made to save components at a sacrifice of quality.

High frequency construction techniques, such as keeping component leads as short as possible and proper bypassing, are important. It is especially important to keep the leads of the amplifier emitters, *agc* control transistors and bypass capacitors extremely short.

This receiver is constructed using a negative ground. It is usually desirable to use negative ground when PNP transistors are used since it is possible to connect the collector coils directly to ground thereby eliminating a bypass capacitor and decoupling resistor.

Building a receiver of this type is a challenging and lengthy project. However, the long life and low price of transistors make it possible for the diligent individual to build his own high quality transistor receiver at a lower price than a vacuum tube receiver. The price of the transistors is less than $2 each except the *rf* transistor which is less than $3.

In conclusion, it is worthwhile noting that certain circuits in this receiver can easily be used to an advantage in other equipment. Of special interest is the composite *agc* system, the squelch circuit, and the audio section.

. . . W3HKX

Letters

Dear Wayne,

I enjoy your comments immensely. You were most generous to give Bill Orr W6SAI all that space to express views contrary to yours (and mine). He says hamming is not a hobby, but a service. By my new Webster's it certainly is a hobby, "An occupation or interest to which one gives his spare time." With which much of his argument falls in shreds. But it was in shreds already.

Carle Conway Jr. WA6TGC

Dear Sir:

Bill Orr said some things with which most of us agree, but he also said some which were, to be charitable, inaccurate. I believe that he has, through his article, placed himself in the same category as G. Crossley (ARRL Atlantic Division Director) who in one breath told a club that hams were no longer capable of constructing their own equipment and, in the next breath, informed them that he had purchased a new commercial transmitter for his use upon retirement. Another blatant example of preaching one thing and practicing another. May his spaghetti be filled with earthworms! Hi.

Karl Ayres WA2ANE

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Converter input provides for 220 - 432 mc and up, as well as for excellent general coverage of the lower frequency bands using Clegg's new ALLBANDER converter/speaker combination (described to the right).

Space will not permit a complete description of this fine new receiver, but we'd like to suggest that you see one at your dealers or write to the factory for complete data

For other Squires-Sanders products see page 29

SUPERB GENERAL COVERAGE
3 THROUGH 30 MC
TO YOUR INTERCEPTOR RECEIVER
(Either B or Earlier Model)

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Frequency range and preselector controls provide easy selection and matching of the desired tuning range while the INTERCEPTOR contributes superb selectivity, sensitivity and stability. After adjustment to the desired frequency segment all tuning is accomplished with the INTERCEPTOR'S main tuning dial.

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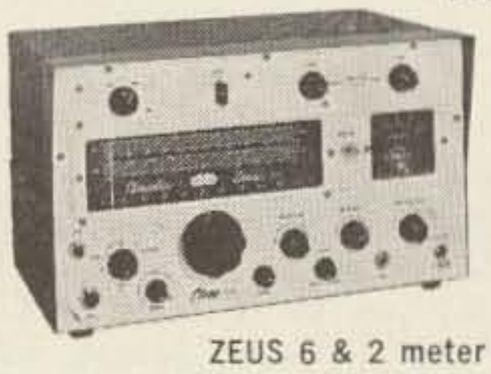

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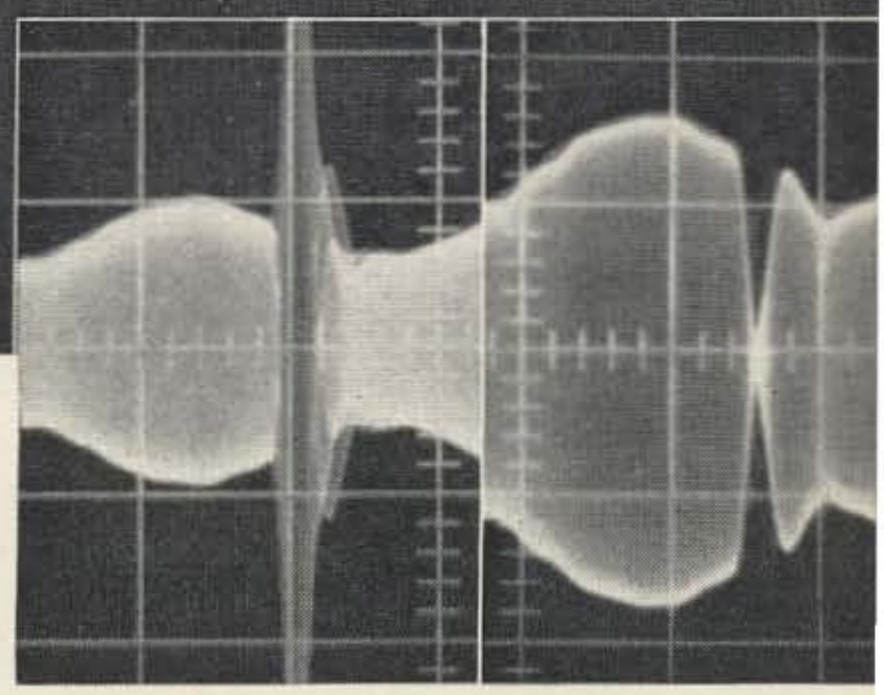

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The SS-1R offers other extremely attractive performance characteristics: frequency precision and stability exceeding that of most frequency meters; digital frequency display requiring no mental arithmetic; autocalibration of all amateur bands with WWV; easy and exact sideband tuning (10 kc. per revolution with manual control) plus push button motor tuning fast traverse — to mention just a few. SS-1R is *The New Standard of Performance*. Now available at your favorite dealer.

[1]"A Pre-IF Noise Silencer", W. K. Squires, W2PUL, QST, Oct. 1963. [2]"A New Approach to Front End Design", ibid., Sept. 1963

SPECIFICATION PROFILE

- **Frequency Coverage:** 80 through 10 M (eight 500 kc. segments). Fixed tuned WWV at 10.0 and 15.0 MC; 5.0-5.5 MC auxiliary (WWV 5.0 MC). Two general coverage 500 kc segments
- **Selectivity:** 5 kc./2.5 kc./0.35 kc.
- **Stability:** Less than 500 cps warmup drift (typically in less than 5 min.); less than 100 cps thereafter including low to high line variation
- **Sensitivity:** ½ μv, or better, for 10 db S/N on 10 M with 5 kc. bandwidth
- **I.F. and Image Rejection:** Greater than 60 db
- **Cross Modulation:** Example: Receiving a **10** μv signal with 2.5 kc. selectivity, an unwanted **0.1 volt** signal 20 kc. away produces negligible cross modulation
- **Internal Spurious:** None at stated sensitivity
- **AGC:** Attack — 1 ms., **Slow** release — 1.0 sec., **Fast** release — 0.1 sec.
- **ANL:** I.F. type; operates on AM, SSB, and CW
- **Size:** 7¾" H x 16¼" W x 13" D, 25 lb.

For other Squires-Sanders products, see Clegg Laboratories advertisement, page 28

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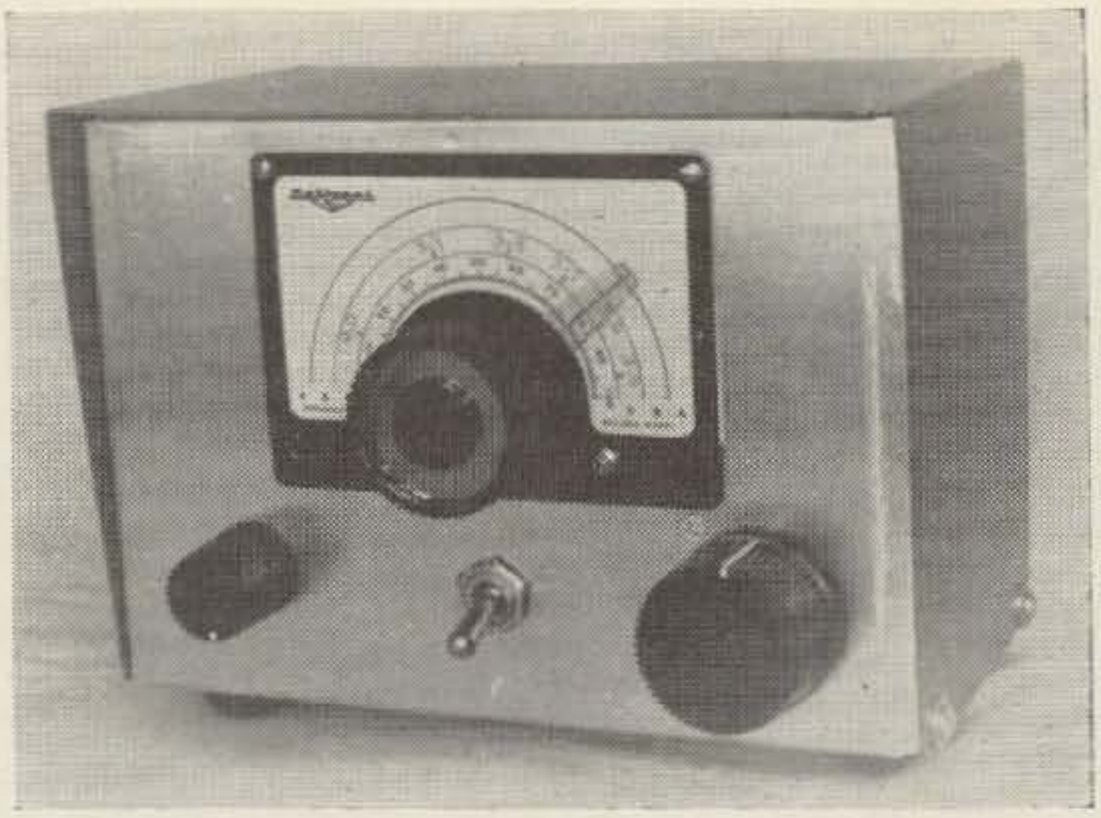


The Receiver Deceiver

Parts Kit Available

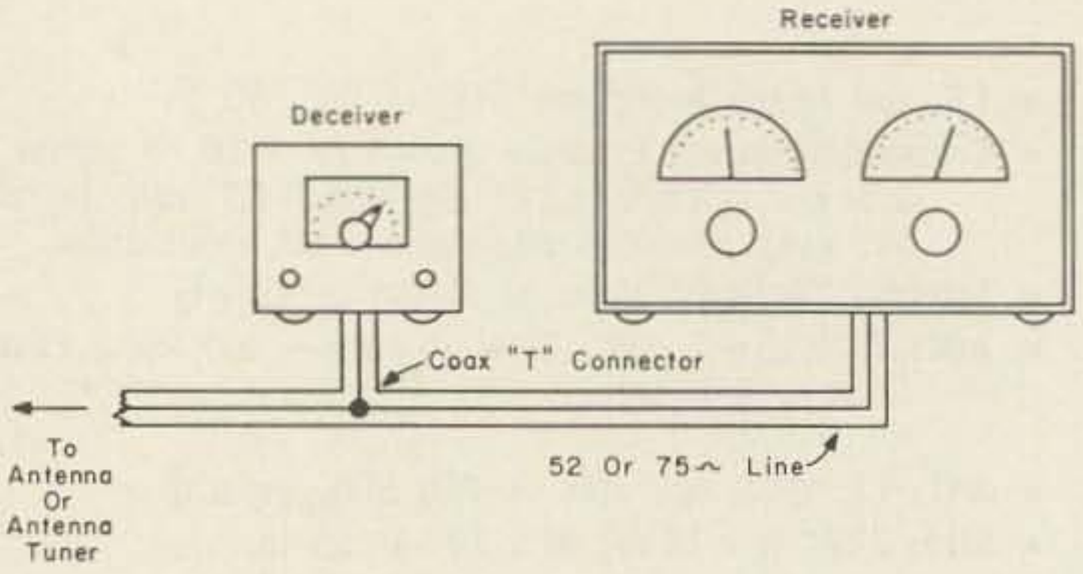
If your receiver is not designed expressly for SSB reception, the Receiver Deceiver will interest you. It is a simple yet highly effective device to provide you with improved SSB reception. It is completely independent of the receiver and does not require any modification to the treasured squawk box. This is extremely important if the receiver is to be traded in some day toward more modern gear.

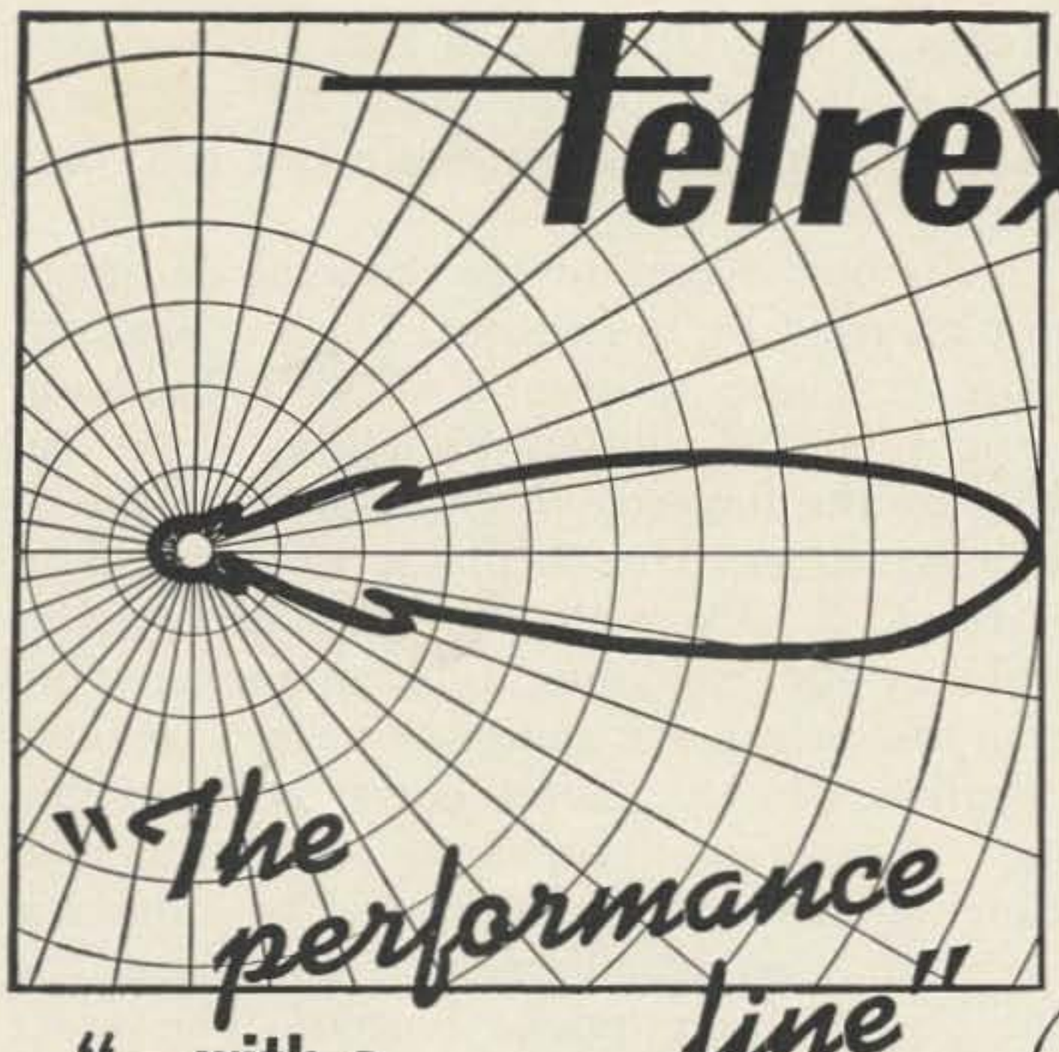
The principle of the Receiver Deceiver was discovered accidentally by the author one evening last winter, but upon investigation it was found that the idea is not original. It has not been used previously, however, in this form.

I had decided to build an experimental transistor oscillator to check out the stability of transistorized VFO's. The low-powered circuit was set into operation on the work bench and the station receiver was turned on to aid in calibration of the tuning range. The receiver was set near 4 mc and some SSB stations were heard in the background. The oscillator was tuned through them and they suddenly became intelligible! It was too obvious to be an invention in the true sense, but it worked well. In a nutshell: A low-powered local oscillator near the receiver to inject a carrier for the demodulation of SSB signals. After some study of the available literature it was decided that this method of SSB reception had some very definite advantages over the BFO injection system. This has been born out in practice.

As with most ideas, there were some pitfalls in reducing it to practice. It was soon discovered that since the oscillator strength could not be varied, and owing to a lack of shielding, the carrier injection was much too strong. The oscillator was then rebuilt in a shielded box and followed by an emitter-follower transistor having a gain control in its emitter. A trial of this arrangement brought to light a basic limitation of transistors. When a cathode-follower tube is used, it provides practically perfect isolation between an oscillator and its load. The transistor was revealed as a two-way device! That is, any slight variation in the load such as that caused by turning the gain control, was reflected back through the emitter-follower, causing an intolerable shift in the oscillator frequency. Even three cascaded emitter-followers were tried and didn't completely remedy the situation! At this point it was decided that solid-state physics was obscuring the original idea, and a shift to vacuum tubes was in order. A coward you say? O. K., then try it for yourself!

Suffice it to say that many breadboard models were built before the final circuit jelled. Many problems were solved incidental to determination of the correct output level,





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effective shielding, power-lead by-passing, and even working out a technique for mixing the carrier in the antenna circuit, at low impedance level, ahead of the receiver.

Basically the circuit is a very low power oscillator, a 6C4, driving a cathode-follower, another 6C4, serving as isolator and gain control buffer. A dual triode was tried in the hope of making the Deceiver a one tube circuit, but coupling due to proximity within the single envelope allowed the oscillator signal to leak past the gain control stage. The unit is equipped with a main tuning dial, calibrated for the bands 80 through 10, and a vernier tuning control (phase control) allowing fine adjustment of voice pitch. Harmonics of the 3.5 to 4.0 mc range are strong enough to allow reception on the higher frequency bands. The carrier amplitude control is used to match the strength of the injected carrier to the strength of the incoming sideband for optimum results.

It is not claimed that the device allows better reception than a receiver equipped with a product detector; this is obviously impossible. What is claimed is that it will give much improved reception with receivers using the BFO carrier injection system. The standard method of tuning single sideband with a BFO is to turn off the AVC, turn the audio gain up full and lower the *rf* gain as far as possible. This is done for two reasons:

1. The BFO will overload the AVC system.
2. The injected carrier must be large with respect to the incoming signal.

The idea is that if the *rf* gain is turned way

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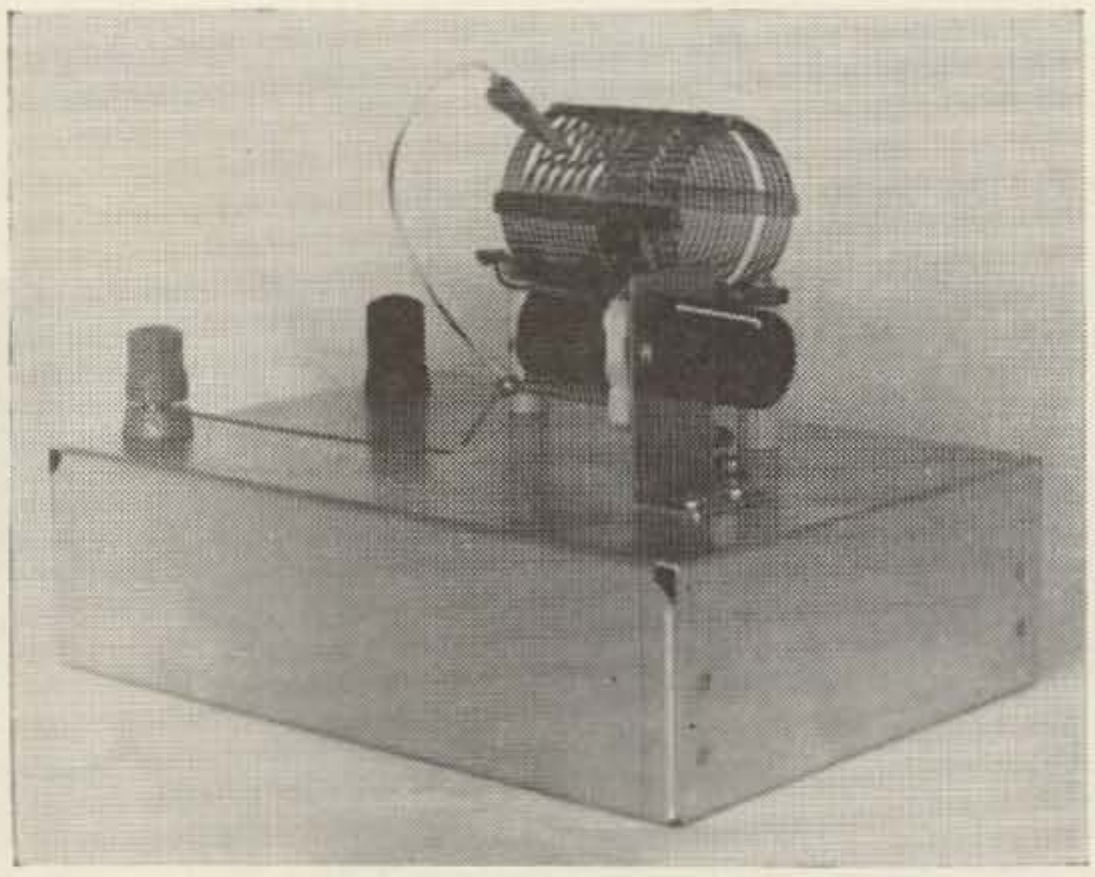
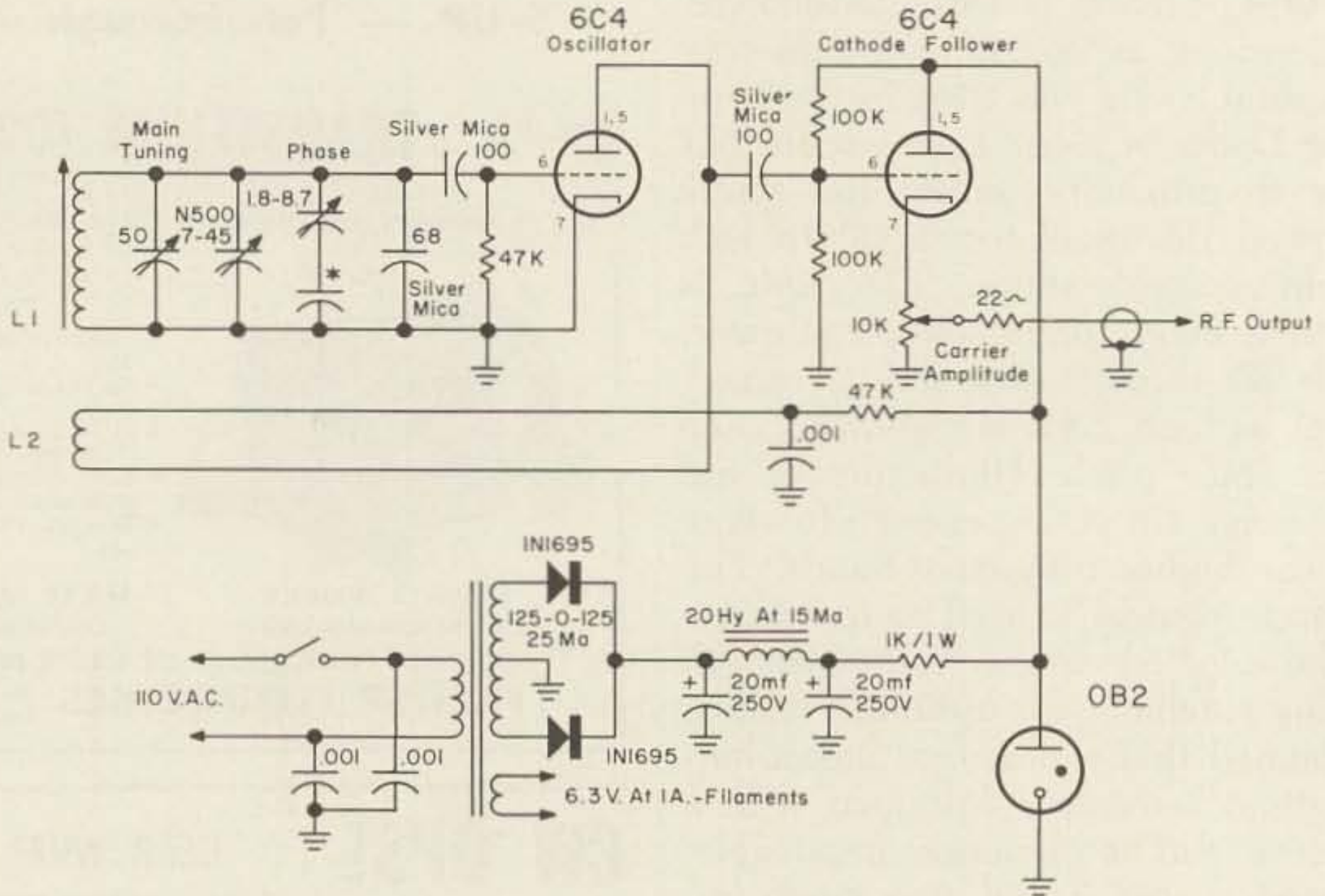


down, the signal at the diode detector is small, thus increasing the *relative* strength of the BFO injection. Unfortunately, most receivers have too weak a BFO to give best results even with the *rf* gain near minimum.

The Receiver Deceiver allows operation with the *rf* gain at maximum and the AVC on if desired. The receiver is deceived into thinking it is picking up a normal am signal and its adjustment is the same as always! One of the advantages of the Deceiver is that the receiver tuning dials may be adjusted at will, and peaked up perfectly without affecting the voice pitch.

The photos illustrate the general construction plan used by the author. The shielded enclosure is made of two 5"x7"x2" aluminum chassis mounted bottom-to-bottom, held together by the four screws through the inverted U-shaped cover. The oscillator is mounted in the front chassis with the regulated power supply in the rear one. Interconnections between the chassis are made with 6-inch lengths of flexible wire to allow access for servicing. Small aluminum L-brackets serve as tube socket mounts and the main tuning capacitor is secured to an aluminum brace spanning the front chassis from top to bottom. The exact construction method is not important except that *rf* shielding must be good and the general rules for stable oscillator construction must be followed.

The only satisfactory method of mixing the output with the incoming sideband at the receiving antenna was found to be at low impedance, say 50 to 75 ohms, and completely



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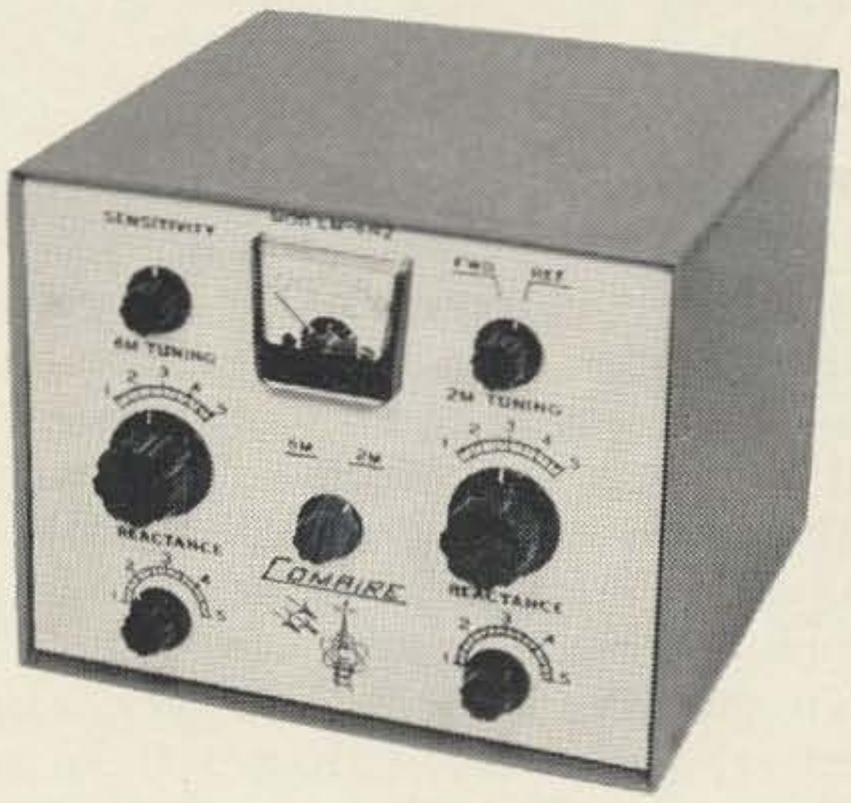

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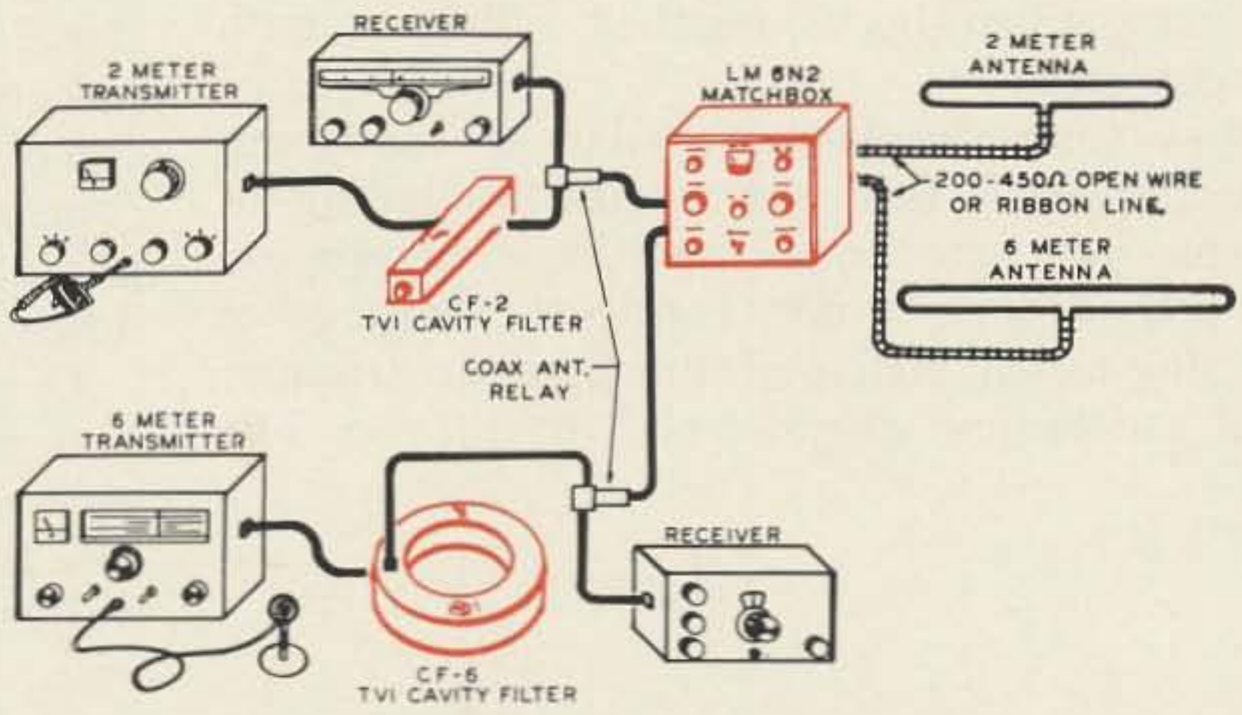

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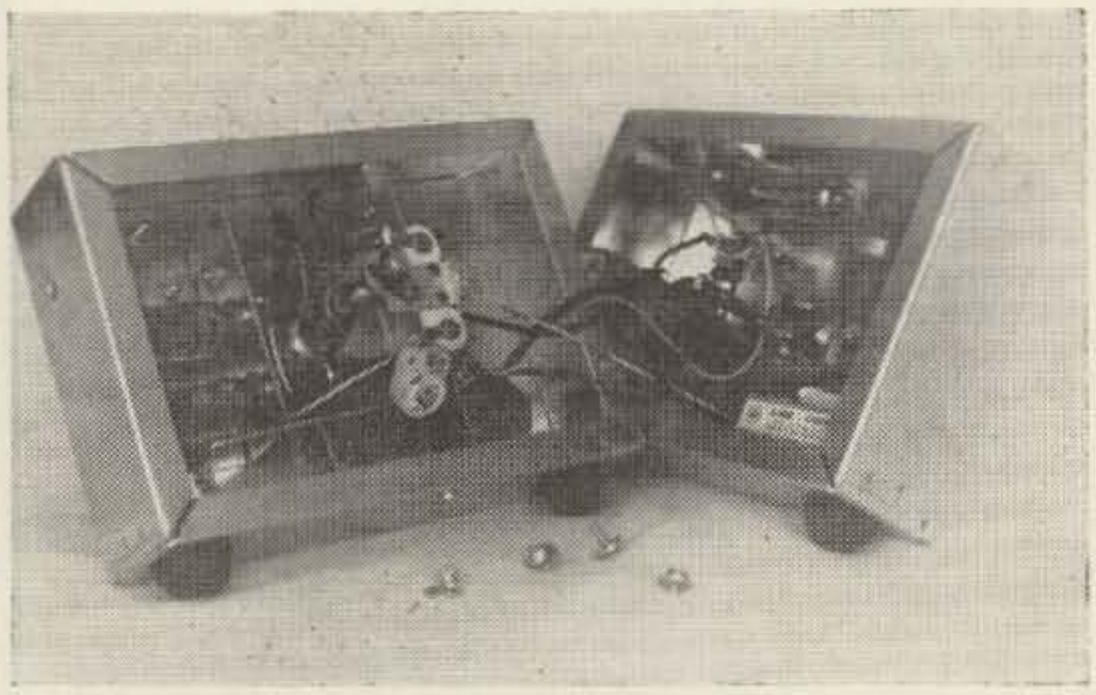
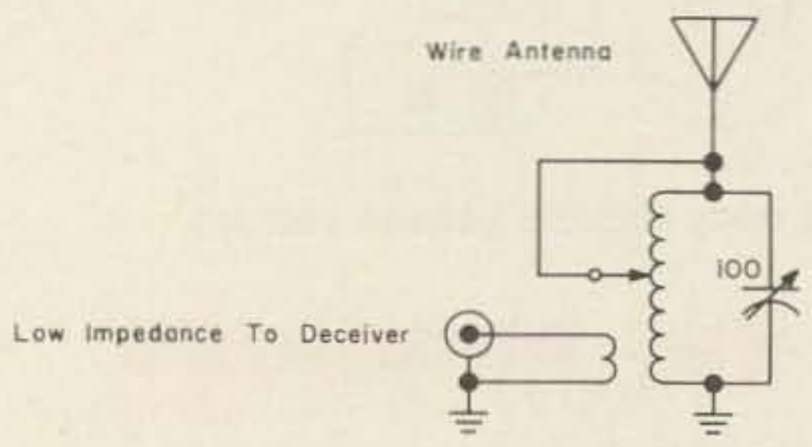


shielded. This dictates the use of a coax fed antenna. If an end fed wire antenna must be used, then it is required that a receiving type antenna tuner or a Balun be constructed to convert the signal to low impedence. The circuit shown is one which worked well at this station. The coil is a modified B&W 75 watt plug-in coil, but a 25 watt coil or piece of Miniductor could also be used.

To align the Receiver Deceiver, a calibrated receiver, preferably with a 100 kc standard, is required. Allow the receiver and the Deceiver to warm up for at least 15 minutes before proceeding with the job.

With the cover of the Deceiver off, determine if the oscillator is functioning by listening for it in the receiver. A signal should be heard somewhere in the 3 to 5 mc range. Now set the receiver accurately to 4.0 mc and set the Deceiver dial to the end corresponding to minimum capacitance of the capacitor. Adjust the 7-45 uufd ceramic trimmer until the Deceiver is putting out a 4.0 mc carrier. Note that you will have to place the halves of the chassis together in order to hold the stray capacitances to the values they will be at with the cover on.

Now tune the Deceiver dial to maximum capacitance. If the unit is now oscillating at 3.5 mc you are the luckiest home-brewer on the planet! If it is not, juggle the settings of the slug-tuned coil, and the ceramic trimmer until the tuning spread is 3.5 to 4.0 mc. The



ANTENNA TUNER FOR RECEIVER DECEIVER

L & C to resonate at 80 M (entire coil) and 40 M (½ coil).

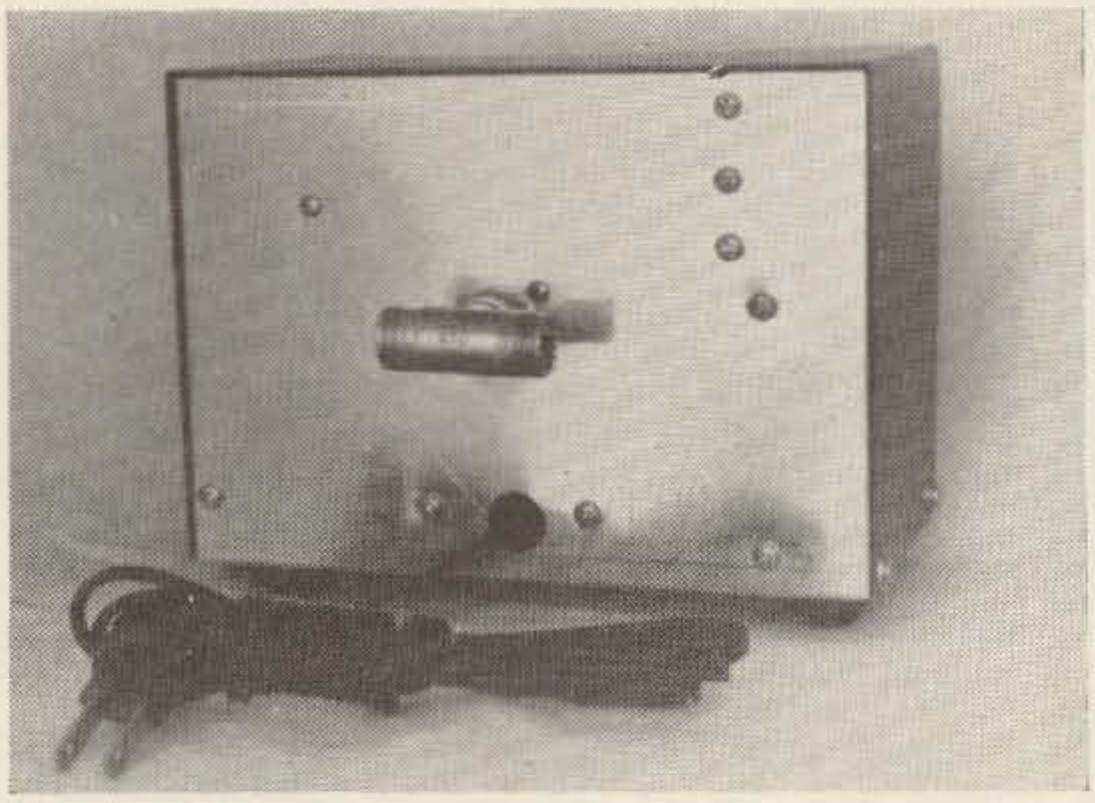
cover may now be put on and the calibration re-checked. If it is correct, calibrate the dial for the bands you wish, and install the unit near the receiver with the coax antenna lead looped through the Deceiver with a coax TEE connector as shown in the diagram.

Operation of the Receiver Deceiver is simple, certainly no more difficult than tuning in SSB with a receiver and BFO. Set up the receiver as follows:

1. *rf* gain on full
2. *af* gain at normal for *am* reception
3. *avc* on
4. *bfo* off

Set up the Deceiver as follows:

1. Carrier amplitude control ¾ clockwise
2. Phase control straight up (½ full capacitance)
3. Main Tuning to approximately the frequency of the incoming sideband.



Peak up the receiver for maximum monkey chatter, and then carefully tune the tuning dial of the Deceiver for intelligibility of the signal. The S-meter will indicate when the Deceiver is tuned near the signal frequency. Once the signal is tuned, the Deceiver *phase* control may be used to trim up the voice pitch as the station frequency drifts up or down the band.

Once you have placed the Deceiver in operation and experimented awhile, you will note several advantages. For example, after tuning in a SSB sig, the receiver bandspread dial may be tuned and peaked up without affecting the voice pitch. The advantage here is that the crystal filter and notch filter can be used to better advantage. The signal can be positioned in the passband as required to eliminate interference without affecting the voice pitch. This is virtually impossible with the BFO injection system.

Another Deceiver advantage is that the carrier injection can be varied from about S1 or

S2 to almost pinning the S-meter. If you will experiment with the carrier injection you will see that there is an optimum carrier strength for weak and strong signals. It will be found that strong AM signals near the desired SSB signal will not ride through as much if the carrier injection is increased past a certain point. It is fascinating to turn down the injected carrier and note the point at which the signal becomes unintelligible.

A bonus advantage is that the drift of only *one* oscillator will affect the voice pitch of the signal. With the BFO method, drift of the local oscillator and the BFO oscillator will cause unstable reception. With the Deceiver, only *its* drift is a factor, and this is relatively small.

When the BFO injection method is used the *rf* gain must be set to a low point, resulting often in a poor signal-to-noise ratio of the first *rf* stage. The required high setting of the *af* gain often results in a large hum in the signal, because most receivers are not designed to operate with maximum *af* gain. Use of the Deceiver eliminates these problems too.

One word of caution is in order here . . . Do not give out any signal reports based upon your S-meter readings! The reading derives entirely from the Deceiver output signal and can be set to any point desired.

If you turn in your present receiver for one designed for SSB reception, you can use the Deceiver as a stable VFO to drive a transmitter. Followed by a class A stage it should give a good account of itself in this service. It would be best in that case to remove the 47K resistor in series with the oscillator plate circuit to increase the output level. A 1000-ohm resistor would be about right.

If the Deceiver puts out too much or not enough signal for your receiver, adjust the value of the series plate resistor. If it is made too large, the oscillator will not operate, however. The plate of the oscillator measures about 25 volts dc with the 47K resistor shown.

. . . W2RWJ

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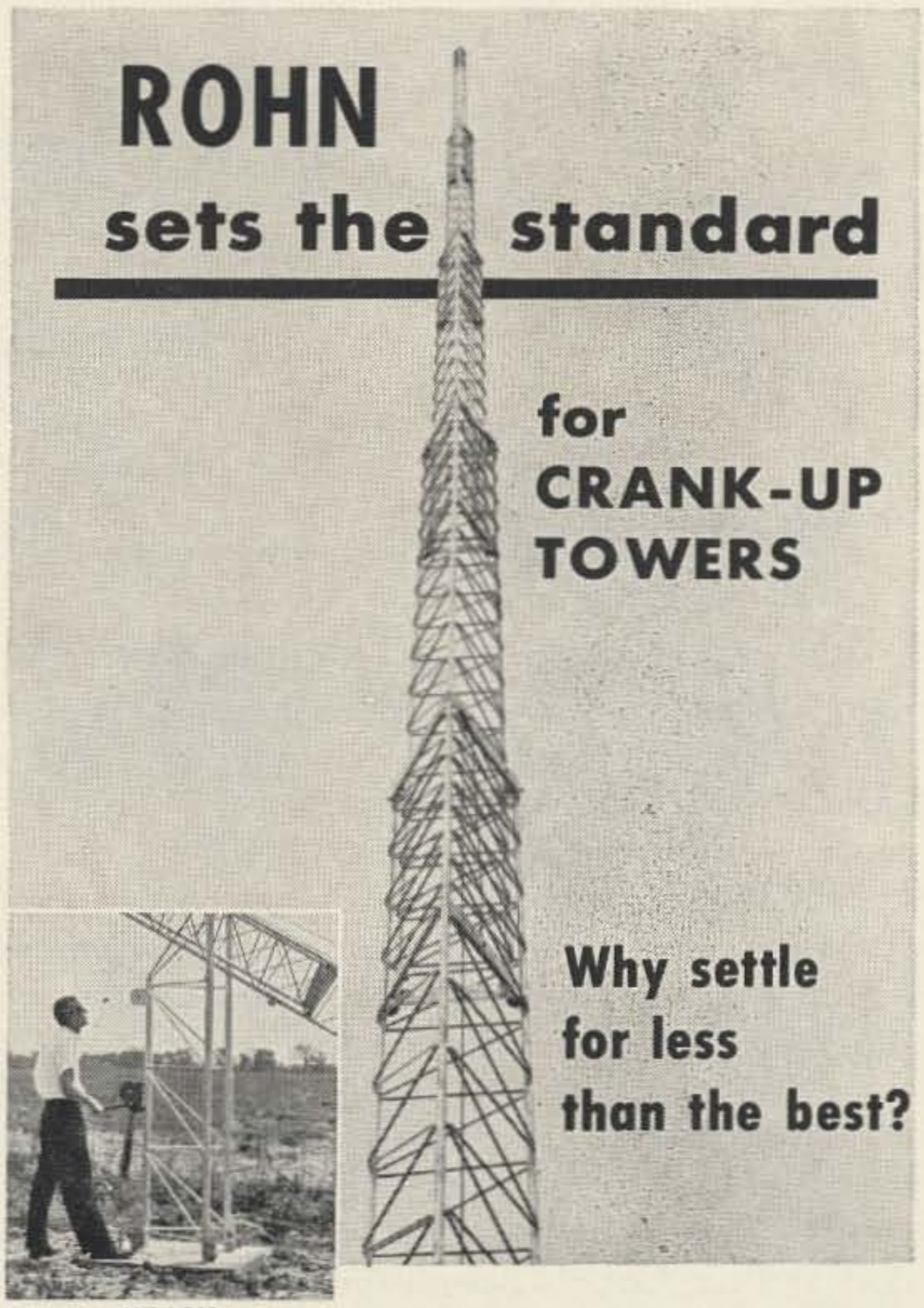

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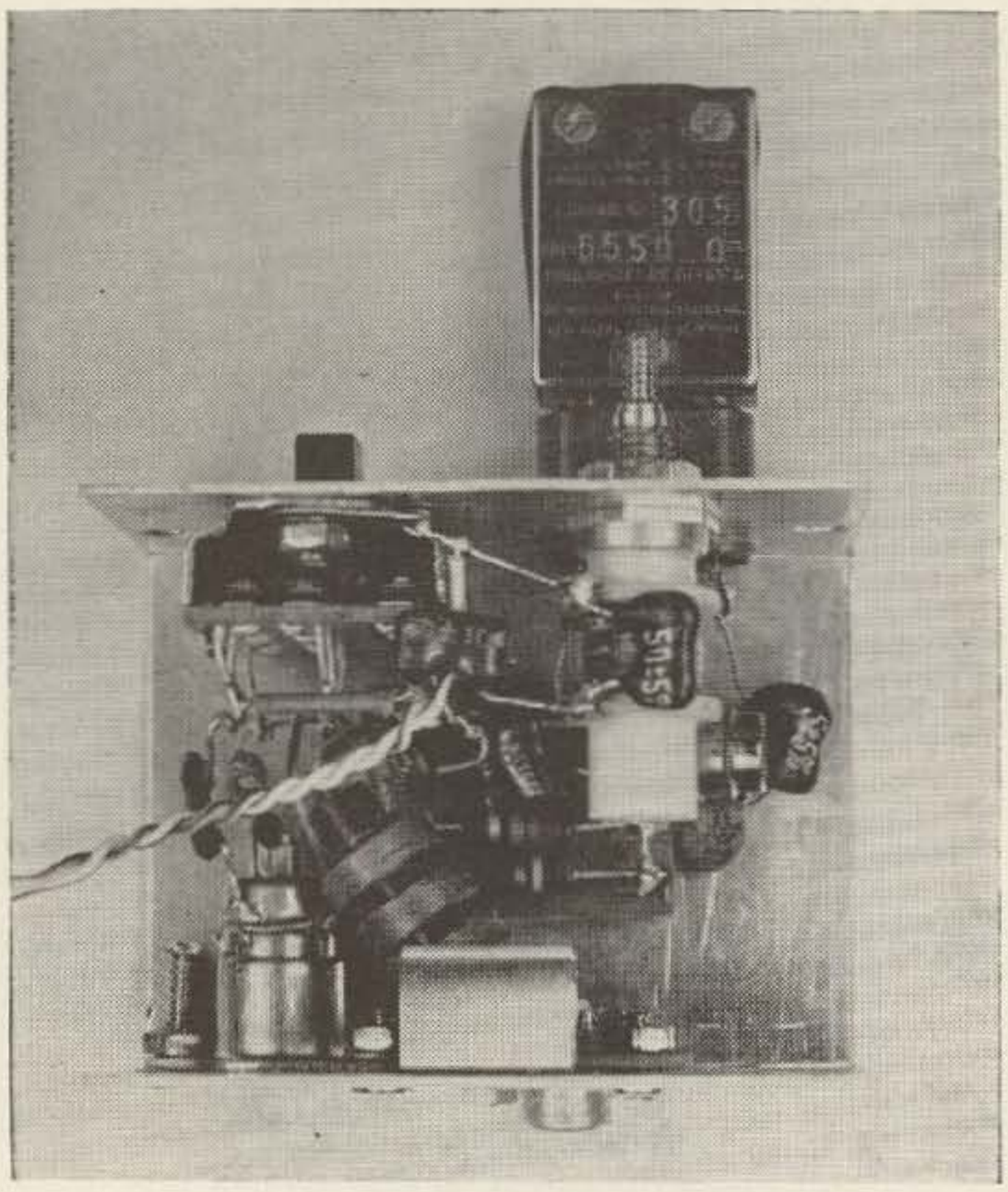
Are you tired of the "Goo for You" that blares from your car radio? You are? Would you prefer to listen to your favorite (HF) ham-band? You would!—Then read on, because you *can* for a meager $10 outlay.

The unit described here is a transistorized converter that operates from a self-contained mercury battery and can be used with the standard automobile broadcast whip. Fig. 1 shows how simple the device really is, and the photograph illustrates the way it looked before the circuitry was finalized.

Things may look a little strange in the circuit at first, but its operation is quite straightforward. Fundamentally it is a grounded emitter amplifier with a crystal and capacitor added in series between the collector and base. The 100μH choke is essential to make the circuit oscillate, since the car radio input presents too low an impedance to sustain oscillations; at broadcast frequencies, however, it has only a minor effect. The circuit is therefore that of a self-excited mixer in which the oscillatory circuit is a Pierce. The parallel tuned circuit L1 C1 resonates in the band of your choice (see table I), and the crystal is chosen in accordance with table II. The unit works quite well using up to the fourth harmonic of the crystal, and in most of the tests surplus FT243 crystals were found to be quite satisfactory.



Almost any good *rf* transistor will prove suitable in the circuit, provided it is operated within its frequency ratings. The 2N 1742 (Philco) is recommended as an excellent transistor to use. However, if you have a spare 2N 247 (now obsolete) it will work perfectly well.

The transistor is tapped down the tuned circuit and the same tap serves also for the antenna coupling—a compromise that seems to work out quite well. R1, R2, and R3 form the bias network for the transistor, and in the set-up procedure R1 may be adjusted for optimum performance. The 2.5mH choke is the load at broadcast frequencies. A three-pole-double-throw switch, S1, is used to change from normal broadcast to ham-band reception. One pole of the switch connects the input of the broadcast receiver to either the antenna or to the output of the converter. A second pole connects the antenna to the converter, and the third pole switches the supply voltage to the transistor on and off. J1 is an automobile radio coaxial receptacle for the antenna input, and J2 is a phono socket for the *if* output—of course these connectors are not mandatory, and you can use other types that suit your particular installation.

The converter illustrated in the photograph was built in a 2¾" x 2⅛" x 1⅝" minibox. The switch, coil, and crystal socket are mounted on the front panel. The rear panel supports the coaxial receptacle J1 and the phono socket J2. A clip, also on the rear panel, holds the mercury battery (not in the photograph because it casts an annoying shadow). The resistors and 100μh choke are mounted on a piece of Erie

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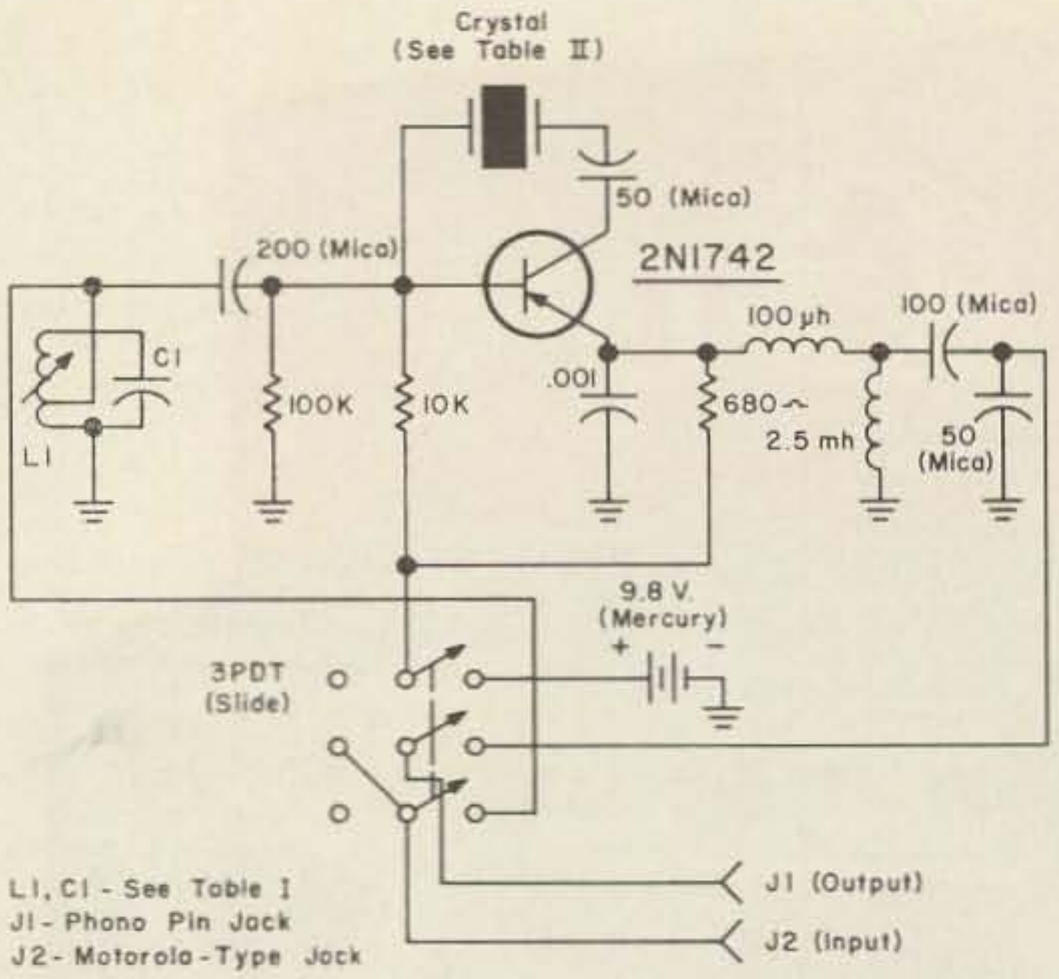


FIGURE 1

"strip package" terminal strip. Since the layout is not critical, almost any arrangement that accommodates all the components would be satisfactory, but it is advisable to keep the coupling between the coil and chokes to a minimum.

The coil is mounted on the front panel so that it can be easily adjusted to peak signals in a part of the band remote from that normally used. For most purposes it is unnecessary to change the tuning of the coil after the initial set-up procedure, since the circuit is broad enough to permit operation over one or two hundred kilocycles without impairing the sensitivity to any great extent. On ten meters (are there any signals there these days?) it might be advantageous to use a variable capacitor in the circuit if frequent qsy across the band is contemplated.

When the unit is complete, check it very carefully for wiring errors and if you are certain that no such errors exist, connect the mercury battery. With no crystal plugged in, check the total current being drawn. If it lies in the range 0.5 to 2.0 ma, then all is well. In the unlikely event that it lies outside this range, R1 may be changed to bring it near 1 ma. Low current can be corrected by decreasing R1, and high current by increasing R1.

Now feed the output of the converter into the homestation receiver and tune to the band for which the converter has been built. Connect an antenna to the converter, switch on and adjust the slug of L1 for strongest signals, using the converter as a preamplifier for the moment.

When the signals are peaked, tune to the chosen crystal frequency (table II), plug in the crystal and check for stable oscillation. If you do not have a general coverage receiver, you can see if there are oscillations by taking hold of the crystal or by touching the collector of the transistor while watching the collector current. The current should vary as these tests are performed. On the other hand you can skip this test and go straight to the following one.

Tune to the broadcast band or connect the output of the converter to a broadcast receiver, switch on, and take your fill of the qrm. At this stage it is just as well to check that the coil is still correctly tuned.

In the car, if a resonant antenna is not available, the converter uses the standard broadcast whip. Just unplug the coax from the input to the broadcast receiver and plug it into the antenna input, J1, of the converter. A piece of coax (preferably low capacitance type, e.g. RG62U or RG63U) with a phono plug on each end is used to connect the converter to the car radio. (Phono plugs fit quite well into the receptacles on car radios.) The length of this piece of coax will be dictated by the location of the converter in your particular installation. If you intend to use the broadcast whip as the antenna, make sure the coax will reach the proposed mounting position.

The author has a multi-band version of this unit mounted under the dash in his car. Band changing is accomplished by switching at point "x" in Fig. 1, and plugging in suitable crystals. A negative ground was used so that in case of emergency, or if the mercury cell failed, connection to the car battery would be simplified. It was decided to include this fea-

Table I

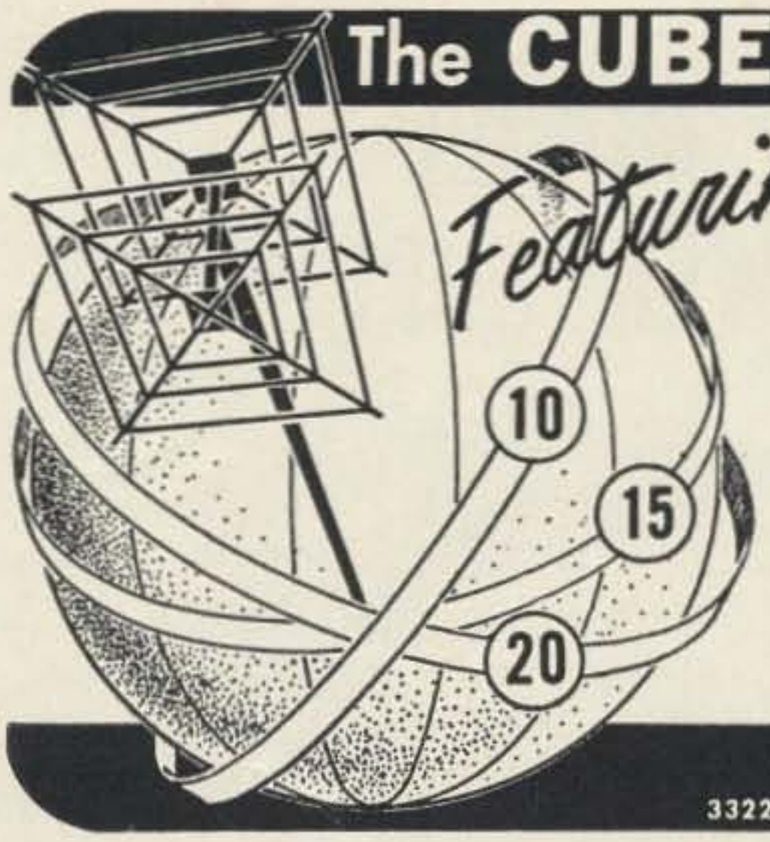
Band	L1, turns	Tap, turns from ground end	Wire gauge	C1 mmF
3.5	40	10	28	175
7	20	5	28	100
14	15	4	22	75
21	10	3	22	50
28	7	2	22	30

All coils close wound on standard slug tuned ⅜" diameter forms.

Table II

Band	Forward tuning Crystal Freq. Mc/s Highest	Lowest	Reverse tuning Crystal Freq. Mc/s Highest	Lowest
3.5 - 3.8			4.7	4.4
3.8 - 4.0			5.0	4.6
7 - 7.3	6.4	6.1	8.2	7.9
14 - 14.35	13.4	13.15	15.2	14.95
21 - 21.45	20.4	20.25	22.2	22.05
28 - 28.5	27.4	27.3	29.2	29.1
28.5 - 29.0	27.9	27.8	29.7	29.6
29.0 - 29.5	28.4	28.3	30.2	30.1
29.5 - 29.7	28.9	28.5	30.7	30.3

Crystal frequency can be a harmonic.
Highest frequency on receiver dial limited to 1200 kc/s to avoid effect of 100µH choke.



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ture in the converter described here. When the multi-band version was built, no 3pdt switch was available, and so a dpdt plus a spdt switch were used to do the job. Of course, one of the dpdt switch poles could have served a dual purpose . . . but let's keep it simple.

. . . VE2AUB/W5

Parts Kit Available

A complete kit of parts for this rig is available at the low price of **$6.95.**

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Going RITTY

Fred DeMotte W4RWM

There are two questions which are always asked by the Amateur who would like to give RTTY a try, and the answers on the whole have been answered in such a manner as to discourage many who would otherwise give the mode a try.

First, one hears, "it is too expensive." Second, "it is too technical." And as a discouraging clincher, "can't get any equipment."

There has been a great deal written about all three of these questions and the ones that floor most amateurs are those that start off with "RTTY is expensive but . . ." and "a higher degree of technical skill is required." Many articles that use these lines for leads, do more to turn amateurs away from RTTY, than any other thing.

The fact is that "going RTTY" is one of the lowest cost layouts that an amateur can own.

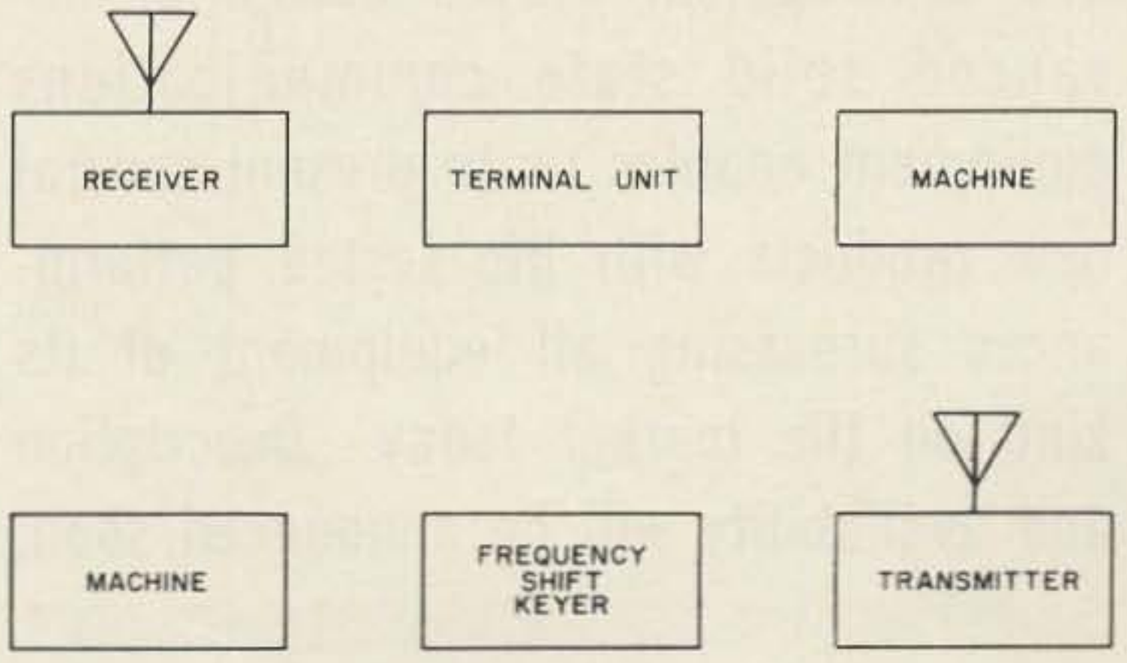
The average amateur has a considerable sum invested in a good commercial transmitter and receiver, plus the auxiliary equipment he has acquired.

These items run as a rule to almost $1,500 per amateur station, so if we use this as a yardstick we find that adding RTTY is only a drop in the bucket to what he has already invested.

Now let's take the statement, "it is too expensive," and see just how much it does cost to get on RTTY.

Let me use the first RTTY installation set-up in the writer's station.

It consisted of a model 26 machine and table for which I paid $50, a home built terminal unit, parts taken from my junk box, and as I recall, none too close to schematic specifications, which cost, as a result, about $5. If you had to purchase most of the parts, it would



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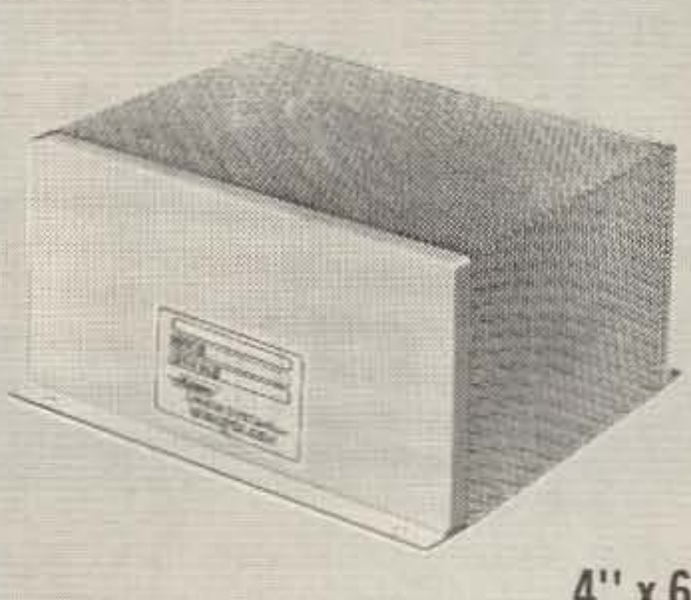

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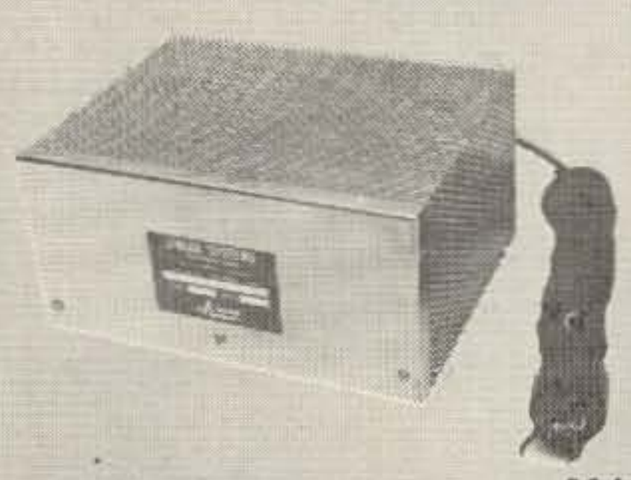

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not be over $30., and the FSK Circuit made from old spare parts cost nothing. If the parts were purchased today, they would cost a couple dollars.

Quick addition will show then that I went RTTY for $55. plus a little construction time.

Of course I had a Navy TCS Transmitter and an old RME 45 Receiver already and since it is assumed that the transmitter and receiver are already part of the station, they cannot be counted into the total cost of getting on RTTY.

That $55. is a long way from those remarks that justify, "it costs so much," for compared to the investment already made, it is only about the cost of attending a weekend hamfest.

If you think that it still cannot be done today for this money, I would say that Model 26 machines are available from time to time for under the fifty dollar figure I paid and terminal units can also be purchased for a very low figure or built from spare parts.

Of course, as with all models, the expenses involved will depend upon the interest of the individual who will demand more equipment, as his interest grows. This is true of any phase of the hobby and should not, however, be used as the basis for the stock answer—"it's too expensive."

Now let's look at the second bugaboo—"it's too technical."

You have a receiver and you have a transmitter and you know how to use both and you know that this does not require a great deal of technical skill.

Now let's apply it to receiving and sending RTTY signals.

Let's look at the receiving side first.

You need the receiver, a terminal unit (converter) and a teletypewriter. The block diagram shows their places in the circuit.

Since you are familiar with tuning a CW or SSB signal which requires your being familiar with BFO adjustment, you should have no trouble tuning a RTTY signal which is nothing more than a steady carrier, being shifted in frequency 850 cycles, by the transmitting station. This produces a two tone audio signal from the receiver output and feeds this to the terminal unit, which converts these audio signals into d.c. pulses which then are fed to the machine, operating the selector magnets on the machine, producing the printed characters being transmitted.

If you can connect equipment together in proper sequence, you will find nothing complicated about it and if you can build simple circuits, it will be a cinch.

Now let's take the transmitting end of the story. Here again a block diagram shows the lineup. A lot will depend on the type of transmitter you have, but nearly all can be made to operate RTTY with FSK or AFSK.

Take the old TCS I started with—only thing I had to do was run three wires to the base of the oscillator tube, one went to the cathode and the others were to pick up filament voltage for the 12H6 diode I used. That's all there was to it.

The FSK circuit was simple, consisting of a 50,000 ohm pot, a 2.5 mh RF choke, two .005 condensers, a octal socket, the 12H6 tube and a small slugged tuned coil form ½ inch in diameter, wrapped with 20 turns of #22 wire, so you will understand that if I could have done it without any extra technical knowledge on the subject, it does not take a radio engineer to do it.

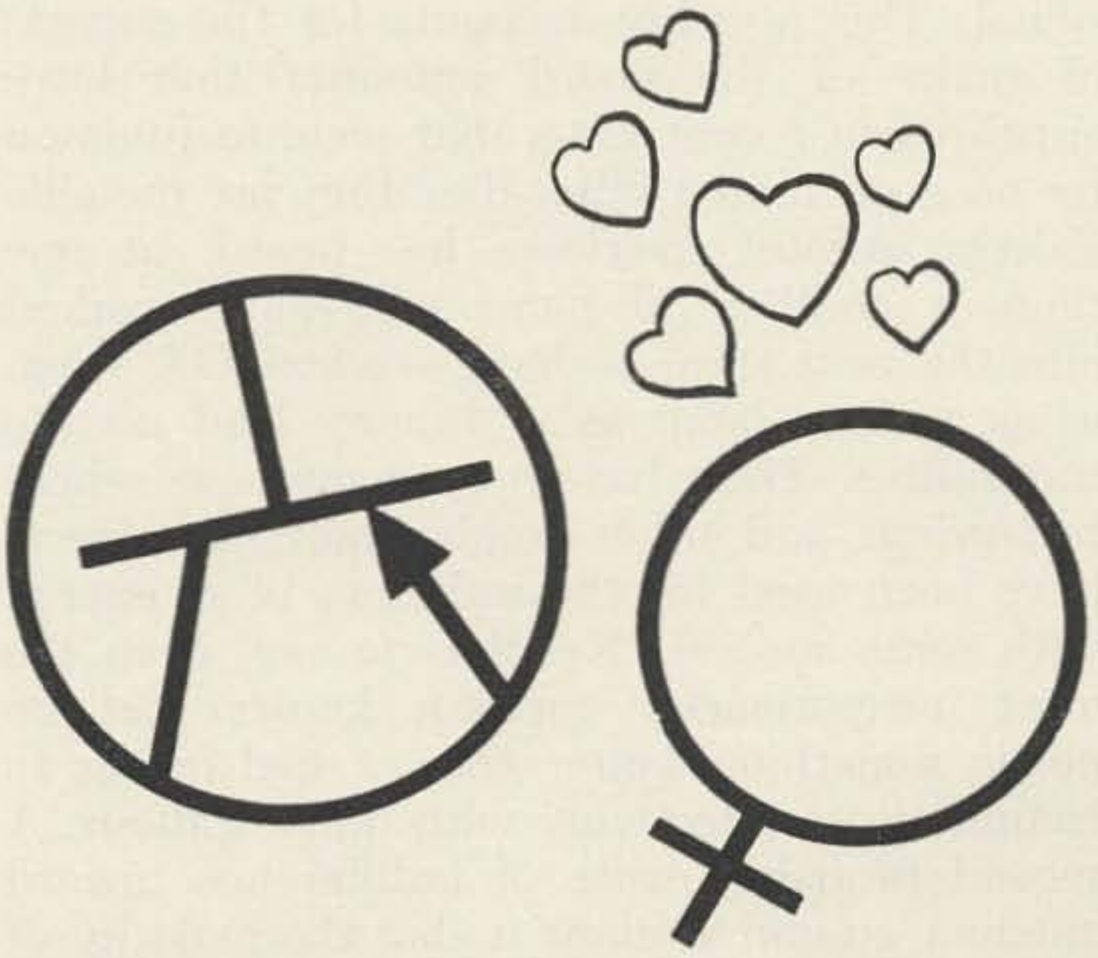
Feeding this frequency shift keyer, to the cathode of the oscillator causes the frequency to be shifted, according to the amount of inductance inserted into the oscillator circuit.

The adjustment of the 50,000 ohm pot in this particular circuit governs the amount of shift and should be set up for 850 CPS.

That's all there is to it, except to add, in answer to "can't get any equipment" that you should contact any RTTYer near you or, better yet, join one of the RTTY societies, who will be glad to assist you in getting machines and giving advice.

Don't let those articles that start off with "it's too expensive" etc. scare you off—for you can get on RTTY for under $100.—easily.

. . . W4RWM



Wayne Pierce K3SUK

Well Grounded

Richard Genaille K4ZGM
719 Quarterstaff Road
Winston-Salem, N. C.

One of the most neglected areas of the average "ham" station installation is the antenna ground system and yet, in almost all cases, it bears equal importance with the antenna itself as far as the radiation of the transmitter output is concerned. Did you know that, without a good ground system, the effciency of a ¼ wavelength vertical antenna may be as low as 50%? If the antenna height is less than ¼ wavelength the efficiency may be even less than that. At this point the advocates of horizontal antennas are probably all muttering, "I told you so." They are almost as bad off as the proponents of the vertical antenna when you realize just how important a ground system is to the operation of any antenna whether it is a horizontal or a vertical.

One of the most probable causes for the lack of attention to the antenna ground system is that one can connect almost any sizable metallic object to the antenna output terminals of a transmitter and manage to radiate a signal. This possibly accounts for the success of many of the weird antennas that have appeared in recent years that seem to function for no good reason other than they are metallic objects. Almost everyone has heard, at one time or another, of hams who have worked into the next state or have worked DX when using a floor lamp as a dummy load on the transmitter. There have been many cases where bedsprings and other sundry metallic objects have been used for the radiation of rf energy with some success. Needless to say, even the most inexperienced operator knows that he needs something better than a bed-spring to communicate effectively with other stations. A second probable cause of indifference toward antenna ground systems is that the majority of antenna distributors and authors of articles describing antennas say very little about the antenna ground system, leaving it pretty much up to the individual. A casual mention of a ground or the ground symbol on a diagram of an antenna system does not mean a ground stake or a simple water pipe ground. What it does mean is a perfectly conducting ground and not one with high enough resistance to dissipate a large amount of your transmitter's power output in the form of heat instead of radiated rf energy. A third quite likely cause is the work involved in fabricating and installing a good ground system. It can be said that a good ground system will, in almost all instances, result in improved performance and efficiency of your antenna system. Before we

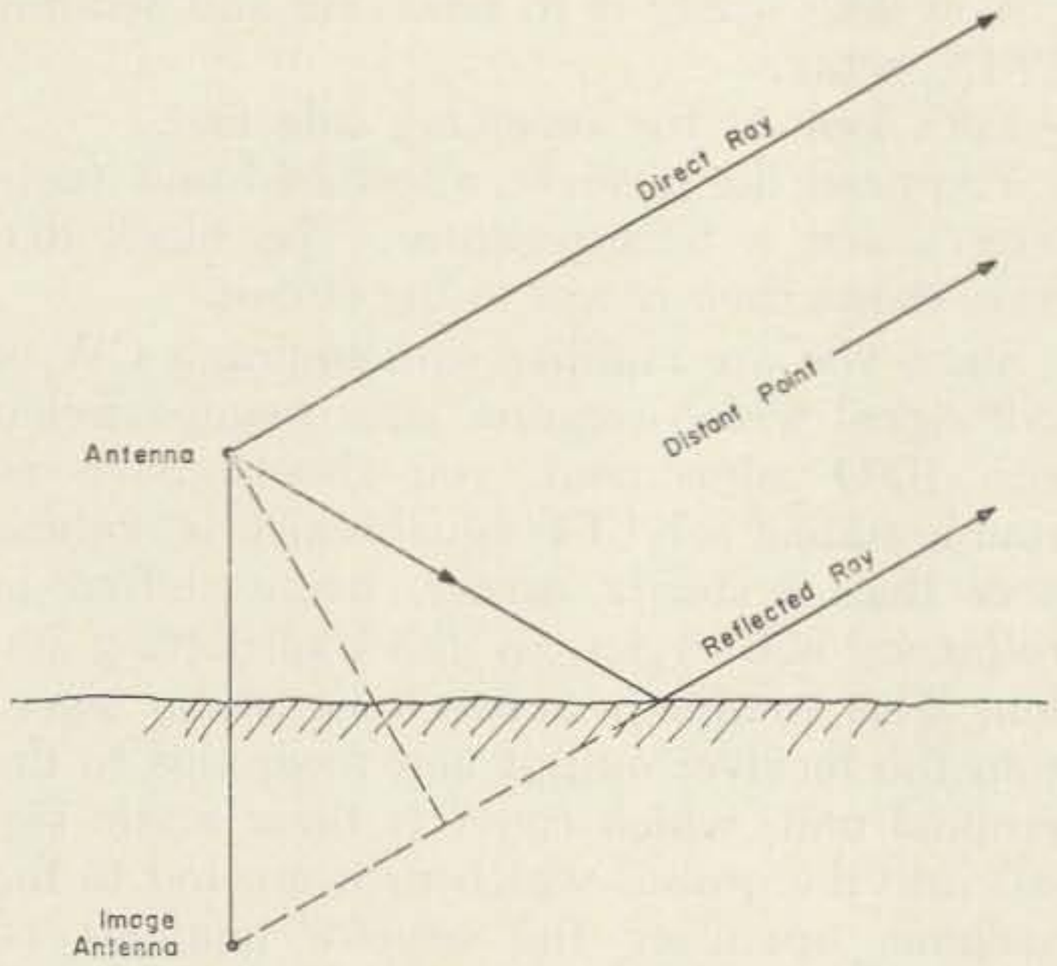


FIGURE 1

Reflection is similar to that of light waves reflecting from a mirror. A poor ground will cause considerable attenuation or complete absorption.
Effect of Reflection From Ground.

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get into the practical aspects of installing a good ground system let's see why a ground is so essential for the efficient operation of both the horizontal and vertical antenna.

It is more than likely that the first discussion concerning antenna operation given in any good antenna handbook or manual is how the operation of an antenna is affected by ground. The proximity of earth to the antenna will modify, to a great extent, the directive properties of that antenna. The usual graphic presentation showing the reflection of rf energy from the ground to aid or oppose radiation in a given direction is shown in Fig. 1. The effect of this reflection is often expressed as a factor and normally appears in graphic form as shown in Fig. 2. The reflection factor graphs have been made up for various antenna heights for both horizontal and vertical antennas. In almost all

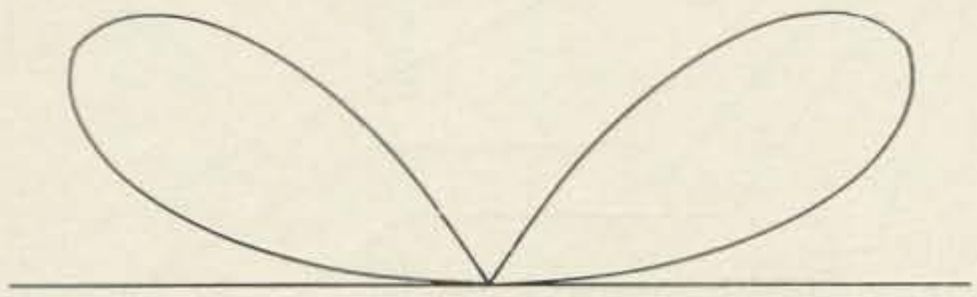

FIGURE 2

Variation in Reflection Factor Over Perfectly-Conducting Ground.

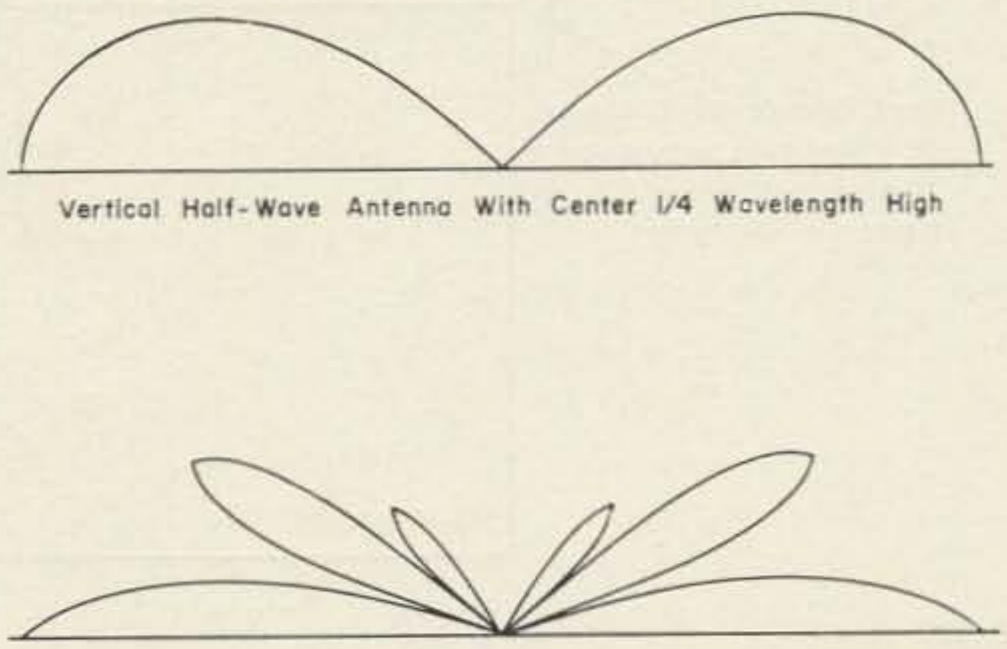

FIGURE 3

Variation in Vertical-Plane Radiation Pattern Over Perfectly-Conducting Ground.

cases the graphs are based on height above and reflection from perfectly-conducting ground. Ultimately, for more practical use, we have available any number of graphs showing the vertical-plane radiation patterns for horizontal and vertical antennas. These are depicted in Fig. 3. These graphs are also based on the antennas being located above perfectly-conducting ground. In a very few instances charts and graphs are found that are based upon ground of average conductivity. In these cases the conductivity and dielectric constant of the ground will be indicated. The vertical-plane radiation patterns are used, by the more proficient operator, to assist him in directing the rf energy from his transmitter to its ultimate goal. The pattern tells the operator that he must place his antenna at a certain height to obtain the coverage that he wants, whether it be low angle radiation for DX or higher radiation angles for more local coverage. The verti cal-plane radiation patterns are used, together

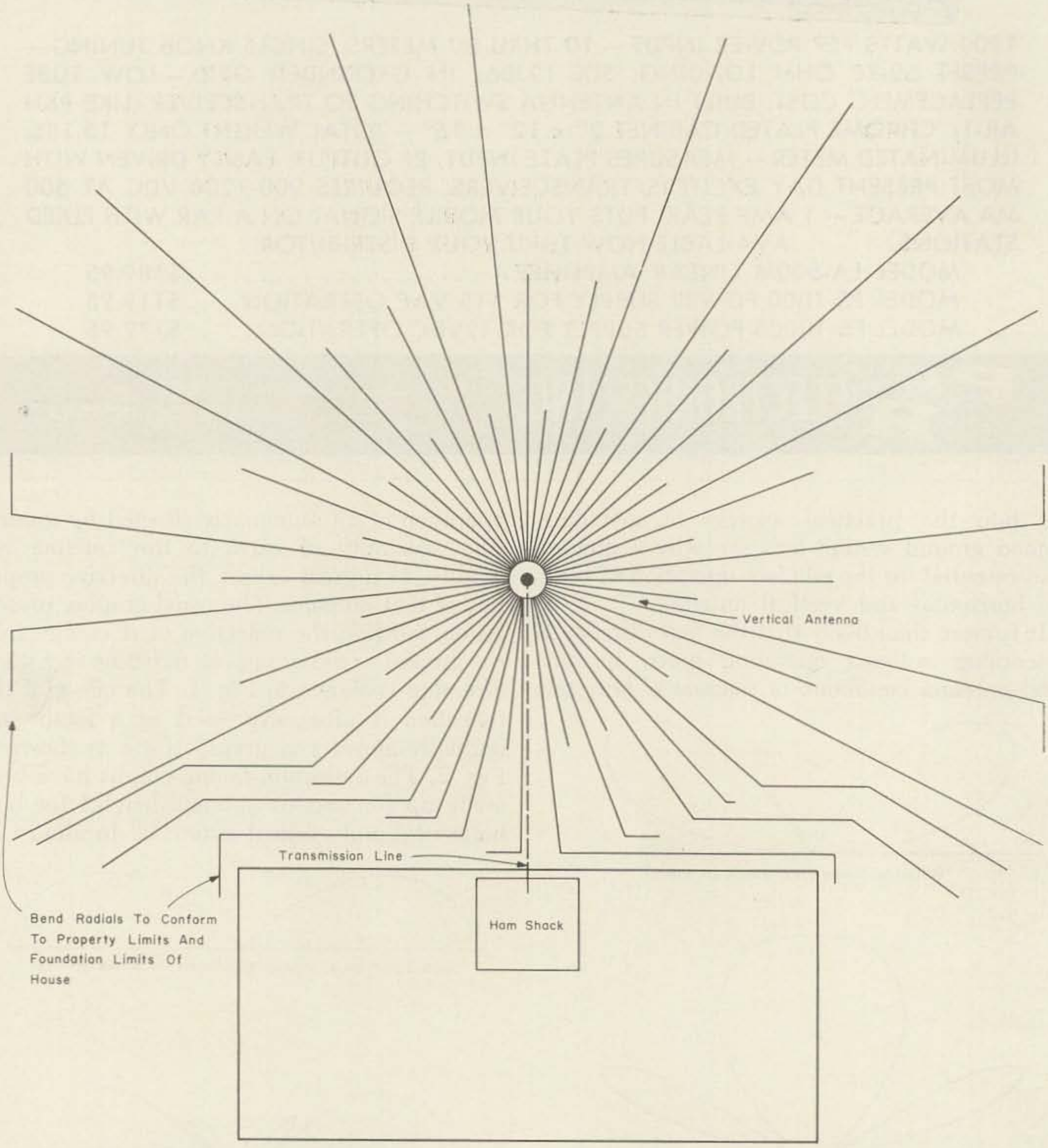
Vertical Antenna
Transmission Line
Ham Shack
Bend Radials To Conform To Property Limits And Foundation Limits Of House

FIGURE 6

Typical Antenna Ground System Layout For Vertical Antenna Centrally Located in Front or Rear Yard. Ground System Connected to Tuning Network Ground or Transmission Line Shield or Braid at Base of Antenna.

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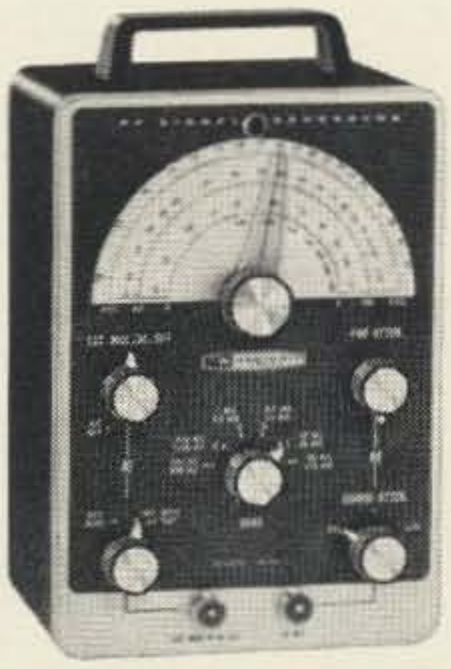

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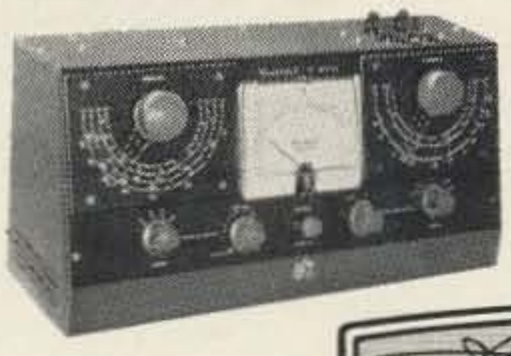

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with other information, by commercial and military communications engineers to lay out the complex antenna fields used for successful and highly reliable point-to-point communication so vital to our nation today. If one is trying to radiate the maximum amount of energy obtainable from his transmitter in a given direction with a high degree reliability in mind he cannot afford to approach the problem haphazardly. The ham today, with the myriad of stations on every amateur band and a limit on his maximum power, must install his antenna and ground system with the same degree of concern if he is to be able to compete in the crowded ham bands.

Another interesting aspect regarding ground is the radiation resistance of the antenna. As can be seen by the graph of Fig. 4, the radiation resistance of a half-wave horizontal dipole can vary from approximately 58 ohms to about 98 ohms for heights of over ¼ wavelength above perfectly-conducting ground. If you want to use that 72 ohm coax for a transmission line and expect to read a 1:1 standing wave ratio on your bridge or reflected power meter you can use this graph to determine the height at which your antenna should be installed. Remember though, this graph is based upon the antenna being above perfectly-conducting ground. Do you know where your actual electrical ground is? If you don't and you want to use this graph to the best advantage you should establish your ground system effectively by installing one.

Ungrounded antennas such as doublets, zepps and directive arrays should be installed over as good a ground system as practicable. While these antennas are normally quite efficient, the losses present are usually the result of ground imperfections. The efficiency and radiation angles of ungrounded antennas are dependent upon the combination of direct waves leaving the antenna *and* the reflected waves from the ground. If the

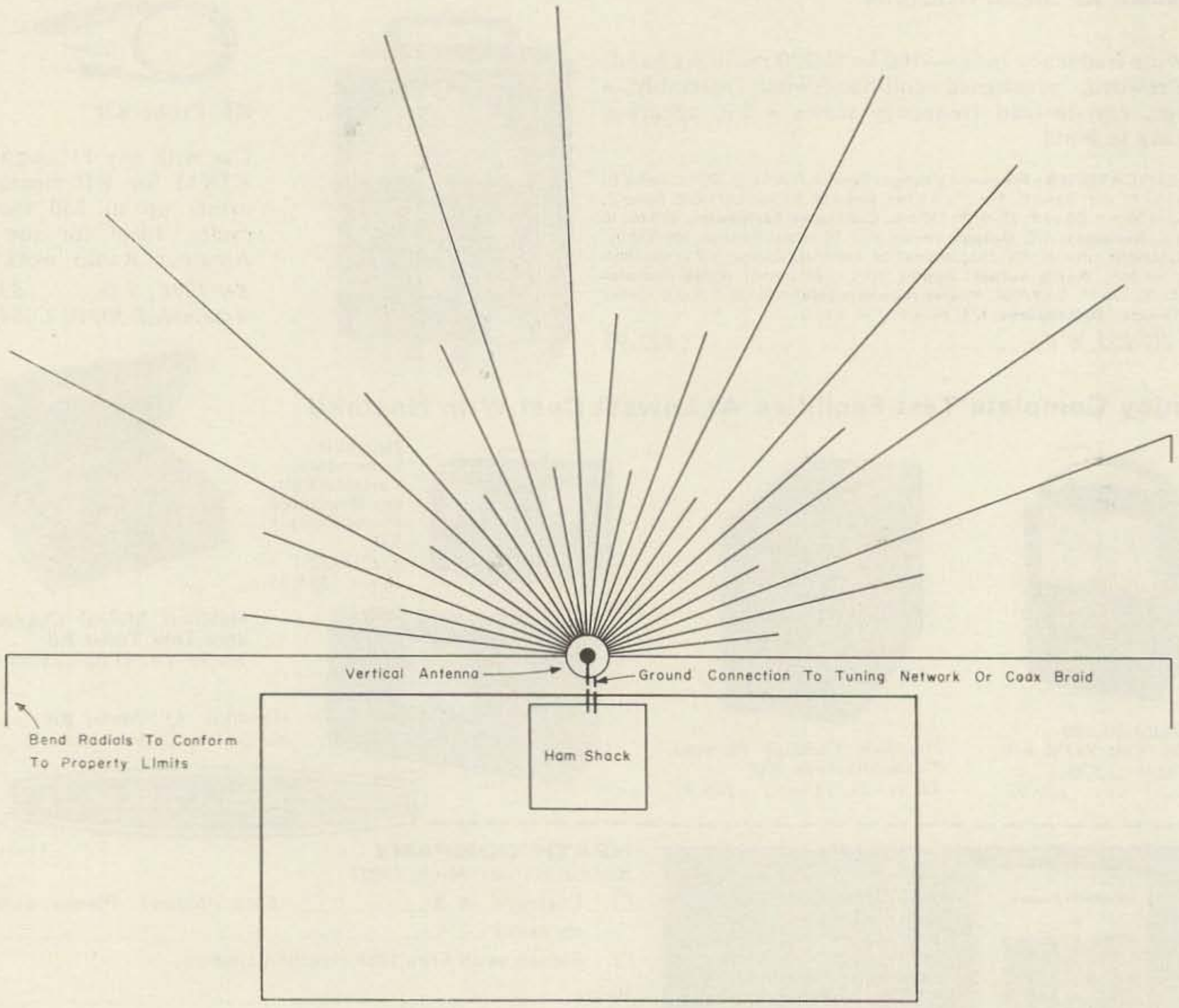

Vertical Antenna
Ground Connection To Tuning Network Or Coax Braid
Bend Radials To Conform To Property Limits
Ham Shack

FIGURE 7

Typical Antenna Ground System Layout For Vertical Antenna Located Next to House.

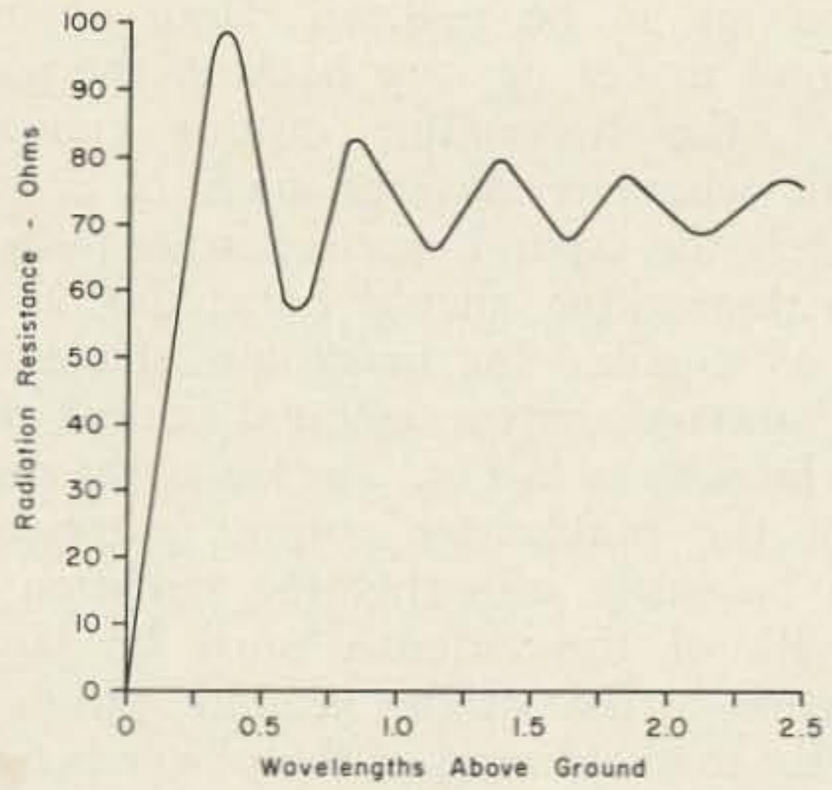
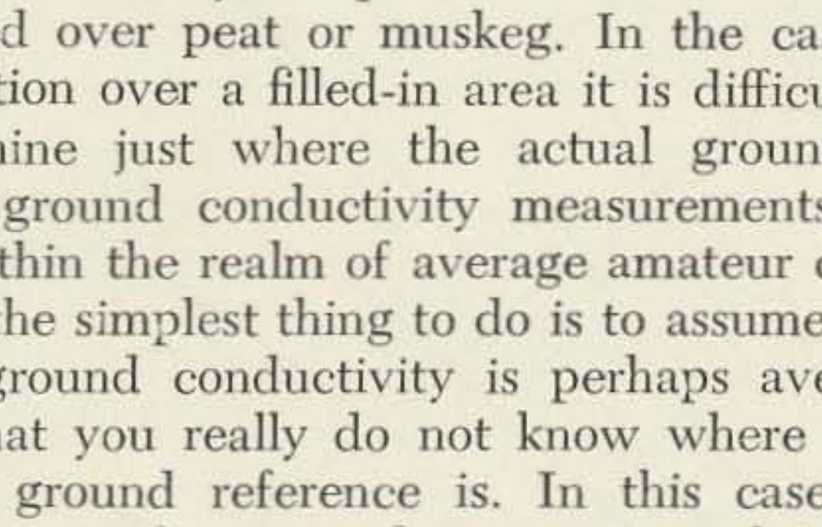


FIGURE 4

Variation in Radiation Resistance of Half-Wave Dipole Over Perfectly-Conducting Ground.

ground is not of good conductivity a considerable amount of energy will be absorbed due to the ground acting as a dielectric with considerable loss instead of as an efficient reflecting surface. For this reason the operation of ungrounded antennas over sea water is usually enhanced by the ocean's high conductivity. The reflecting surface of the earth or the "effective reflecting plane," as it is sometimes called, is usually several feet below the actual surface and may be quite a few feet if one is situated over peat or muskeg. In the case of a location over a filled-in area it is difficult to determine just where the actual ground is. Since ground conductivity measurements are not within the realm of average amateur capability the simplest thing to do is to assume that your ground conductivity is perhaps average and that you really do not know where your actual ground reference is. In this case the installation of a ground screen several inches below the surface of the ground and in the area beneath your proposed antenna installation will effectively establish your reflecting ground surface. The graphs and charts will become more meaningful since you now have a



Transmitter Output Is Dissipated Proportionately Between RA & RG

FIGURE 5

Antenna System Resistance For Vertical and Horizontal Antennas Worked Against Ground.

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starting point from which to work. The height of your antenna above ground will now be the actual distance that your antenna is above your installed ground screen. You can now predict, fairly well, what the characteristics of your antenna will be, that your vertical radiation angle will be approximately what the graph says it should be and that the efficiency of your antenna system will be about the best that you can possibly make it.

Horizontal and vertical antennas that are operated against a ground, that is, one side of the transmitter output connects to the antenna and the other side connects to ground, must have a good ground or suffer a considerable loss in efficiency. These antennas make use of the ground for the flow of rf energy back to the transmitter. This energy normally returns on the shield or braid of the coaxial transmission line if it is used. In the event that one uses the off-center fed Windom with a single wire feed system he must also provide a substantial ground system if the benefits of this type of antenna are to be realized. Here again the rf current makes its way back to the ground side of the transmitter output connection through whatever devious path is available. Obviously the ground connection, or path back to the transmitter, should be as low in resistance as possible for maximum efficiency. A typical antenna system operated against ground might be seen as in Fig. 5 as far as the dissipation of the transmitter output is concerned. It can be easily seen that the radiation resistance Ra of the antenna must be large in proportion to that of the ground system resistance Rg to avoid most of the power being dissipated in the ground system resistance. If Ra is equal to Rg then one-half of the rf energy being fed to the system is being lost in Rg. Not a very effective way of getting out, is it?

Lower frequency antennas are especially susceptible to losses due to the large currents which flow in the earth near the antenna. These losses can be practically eliminated with

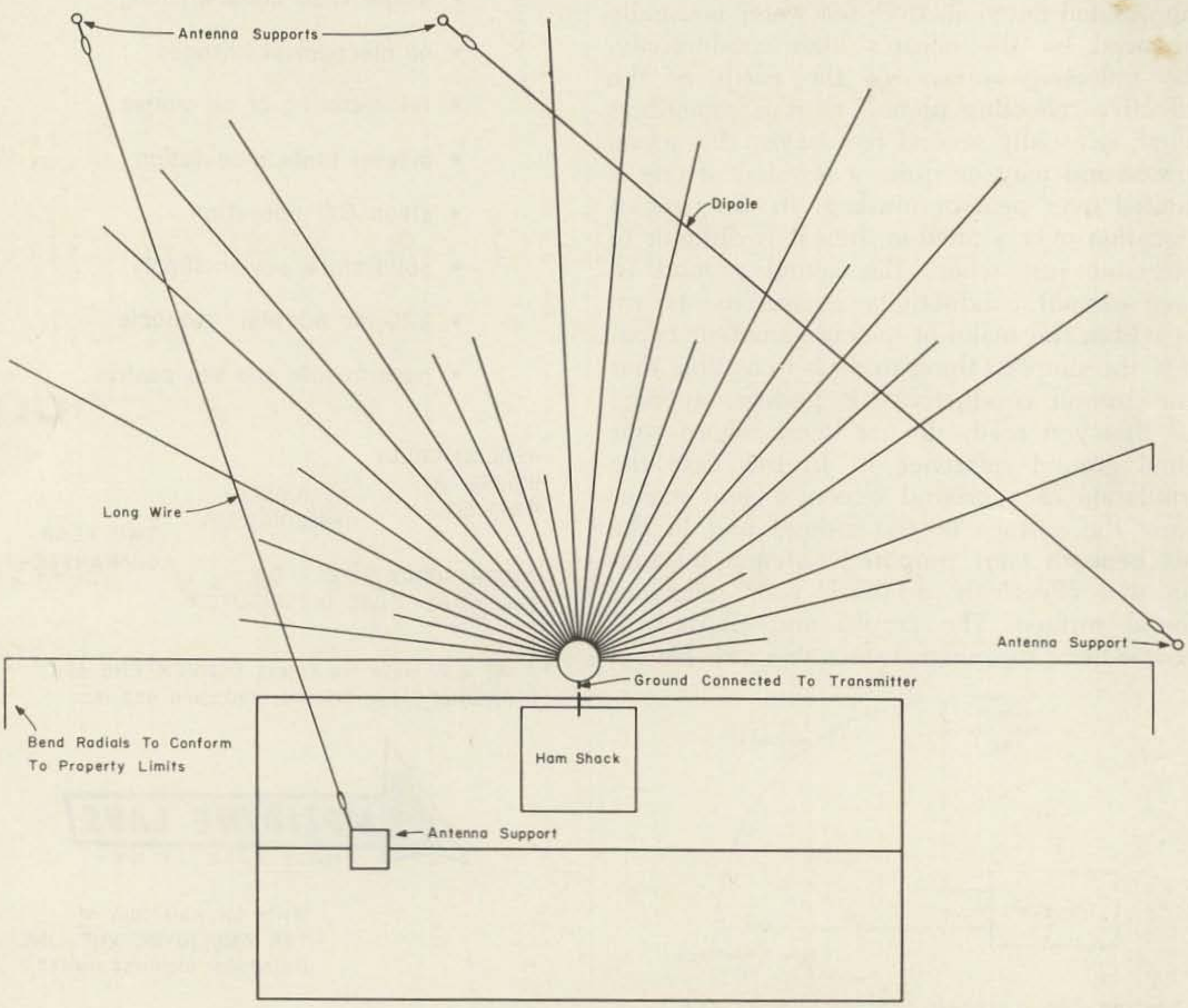
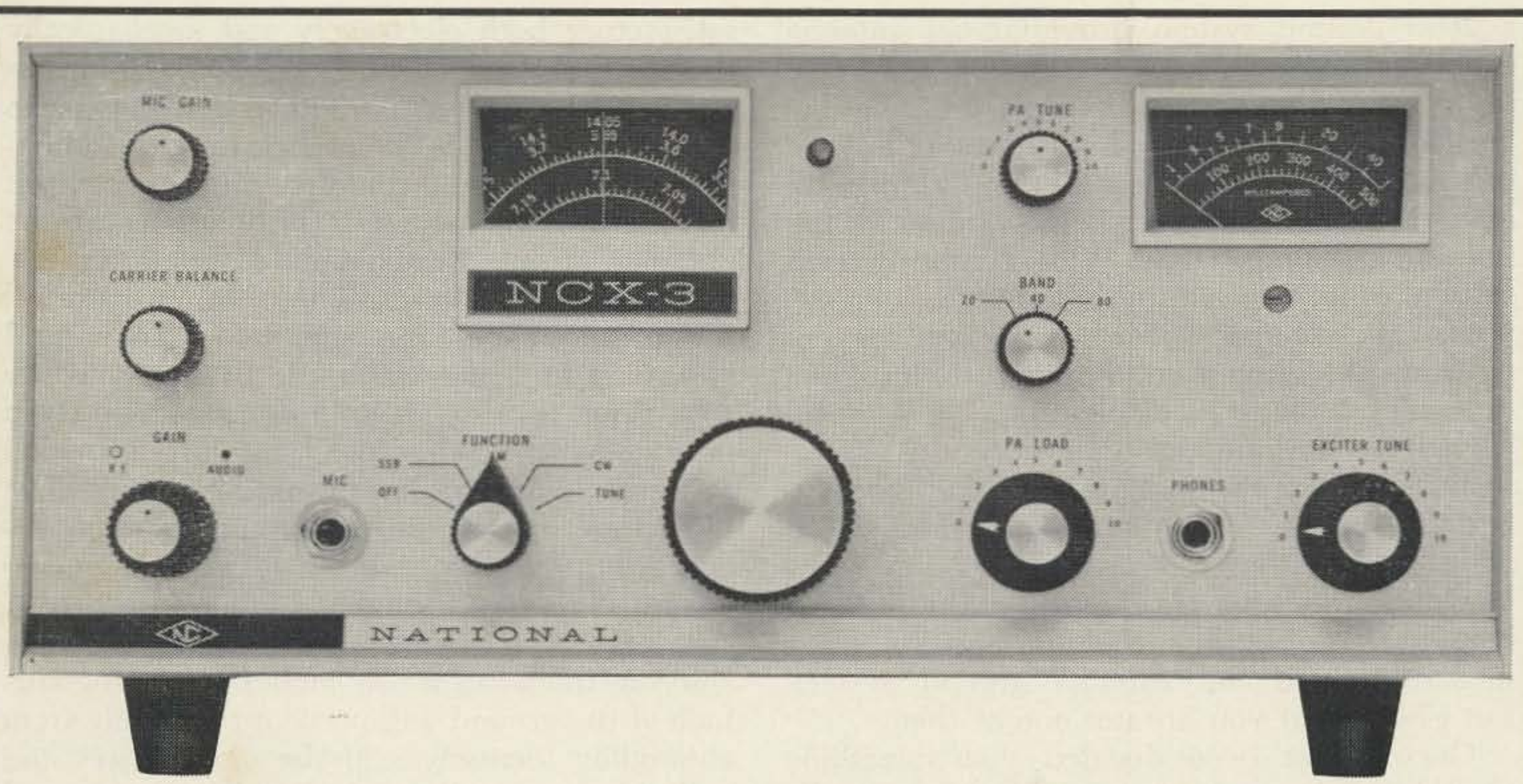


FIGURE 8

Typical Antenna Ground System Layout For Horizontal Antennas.



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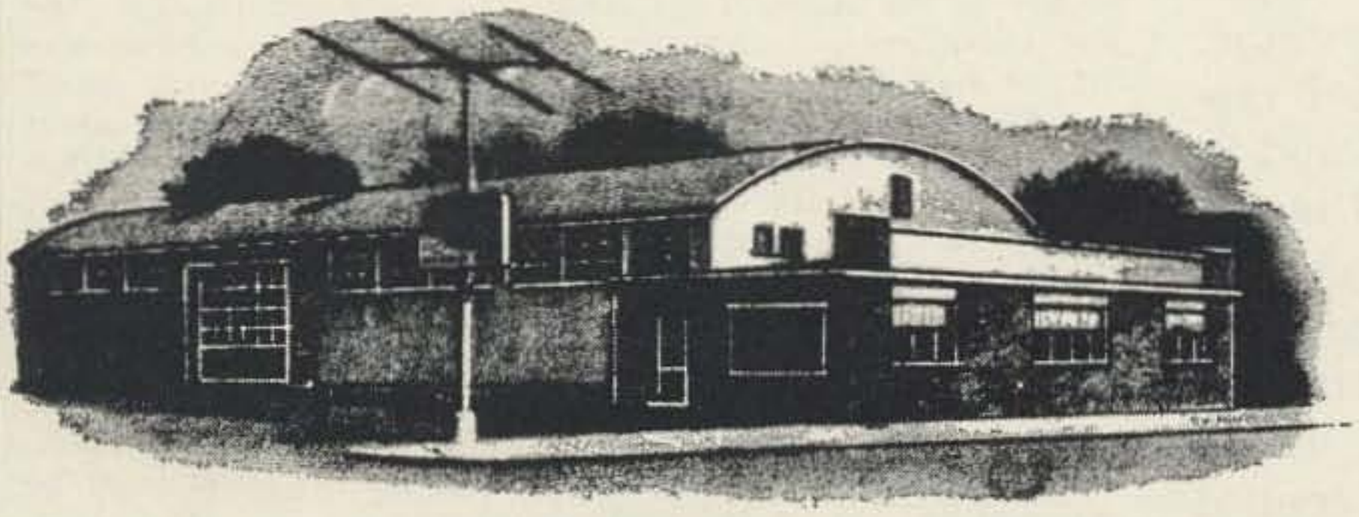

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a good ground system providing an antenna efficiency above 90%. The radiation resistance of a vertical antenna shorter than ¼ wavelength is such that very high currents flow in the ground, more so than for a ¼ wavelength antenna, and for this reason the ground system is even more important. With a good ground system even ⅛ wavelength antennas can approach the efficiency of a ¼ wavelength antenna using the same ground system. It has been determined that the efficiency of a ¼ wavelength vertical antenna with as few as 15 radials may be on the order of only 50%. Decreasing the number of radials to 2 results in an efficiency of only 25%. Can you afford to throw away 75% of your transmitter output? Many hams are doing just that because of their neglect toward the antenna ground system. Let's hope that you are not one of them.

Once it has been decided that something should be done about improving or initially installing a ground system, the question arises as to just how far one should go. The best thing to do, as mentioned previously, is to assume that the ground in your area is not perfect and then try to install the best ground system that is economically feasible and physically practical. The ideal ground system, consisting of 10 wires each at least ½ wavelength long and extending radially from the base of the antenna, is not always practical for amateur installations. The author has found that the best rule of thumb to follow is to put down as much copper as is convenient and economical in the immediate area of your antenna. The lengths of the radials are usually limited by the size of the lot. Even if one has a small lot he should not be deterred since the gain in efficiency will be well worth while. Any size of copper wire larger than #16 will be quite satisfactory for the radials. Don't rely on water pipe grounds for your antenna ground system. In most cases water pipe grounds are not sufficiently extensive to do much good. Many areas are making use of plastic pipe which precludes the use of the water pipes in these areas. Poor electrical joints due to the use of pipe compound are another bugaboo experienced in making use of water pipe systems. Typical arrangements for antenna ground system installations are shown in Figs. 6, 7 and 8.

Cutting the radial wires to length and bonding all of the wires together at one central point is not extremely difficult but it can get somewhat tiring especially when one tries to tie 40 or 50 wires together in one place. There are any number of ways in which the central connection may be made. If the resultant is satisfactory both electrically and mechanically the method used can be considered to be as satisfactory as any other method. For those who wish to avoid the work in fabricating the antenna ground system, a complete radial system kit for the average amateur installation can be obtained from Ready-Radials listed in the pages of 73 Magazine. These kits provide all of the necessary components for the ground system. The radial wires are all connected to a hub ring to which a ground connection strap is attached. Wooden pegs are also provided to facilitate the anchoring of the radial wires to the soil or turf. Regardless of how you obtain your ground radial system the author recommends that the wires be buried except if the installation is to be a temporary one. Burying the wires a few inches below the surface of the ground will prevent the family from entangling themselves in the radial wires and will also prevent the wires from being chewed up by the lawn-mower. Burying the wires may be accomplished by slicing the ground with an edger or other suitable tool and then pushing the radial wires into the slit. Once the wires are buried you need not worry about them for a long time. Your ground system is in for good.

If you are not completely satisfied with the operation of your present antenna and suspect that you may be wasting much of your transmitter output you may find that the installation of a good ground system will produce results that you have never had before. Give your antenna at least an even chance of radiating the output of your transmitter and you will be better able to meet the competition on the ham bands.

. . . K4ZGM

Correction

Dear Wayne:

I just answered a reader who built the transistor power supply in the April, 1963 issue. He made substitutions for just about every component in it. His major problem was that it had approximately five volts output, which could not be varied. Fortunately he described things in great details. It took me awhile to realize that the rectifier diodes D1—D4 are all shown backwards in the schematic! The circuit is peculiar in that the polarity of the voltage at the output terminals is the same regardless of the polarity of the unregulated voltage applied to the input.

My turn for a red face! In checking back I found that I goofed in copying the finished schematic to be included with the manuscript. The schematic is otherwise correct. Either the diodes, or the two bridge output leads need be reversed to correct the difficulty.

C E. Miller W1ISI

Inter-Element Conductivity

Beam type antennas usually incorporate telescoping element provisions to facilitate tuning for a desired frequency. In addition, adjustment preferences as to maximum front-to-back ratio and maximum gain are further expedited with adjustable element tubing.

Newly installed antennas, whether commercial or homebrew, require some alteration in order to obtain the maximum power transfer factor. Once the unit is properly adjusted it is assumed by the amateur, although incorrectly, that his radiating system will retain its initial inherent characteristics. Little thought has been given to the finite resistances developing between element joints due to the consequences of outdoor exposure. Aluminum, for example, develops a scale of oxidized material which has a lower conductivity factor than aluminum, thereby restricting the flow of voltage and altering electrical and impedance characteristics.

To provide unrestricted voltage flow, Penetrox A has been developed by the Burndy Corporation (Norwalk, Conn.) to insure continuity through mechanical joints where a low loss dialectic constant is requisite. Chemically, the material is a composition of petroleum and alum stearate base grease and zinc dust. The theory is that the grease component seals off the coupled units from the effects of the weather, whereas the zinc provides the medium for a low resistive path.

An engineer from Burndy indicated that the Penetrox material melts to fluid at 165c but "joints tested at 200c were excellent elec-Penetrox material melts at fluid at 165 C but "joints tested at 200 C were excellent electrically." He indicated further that "extensive and intensive testing has proven that Penetrox A does not lessen the insulating qualities of rubber . . ."

To use, lightly sandpaper the units to be joined with emery cloth and liberally apply Penetrox to both sections. A suitable clamp arrangement will insure a secure mechanical bond.

Additional trouble-free years of antenna use will result as the direct consequence of utilizing this material; however, its use is not entirely restricted to antenna design. Those amateurs using the electrical conduit as transmitter ground potential will also benefit from resistive free mechanical connections between the transmitter ground and reference ground via the many B-X and conduit joints.

. . . WB2CQM

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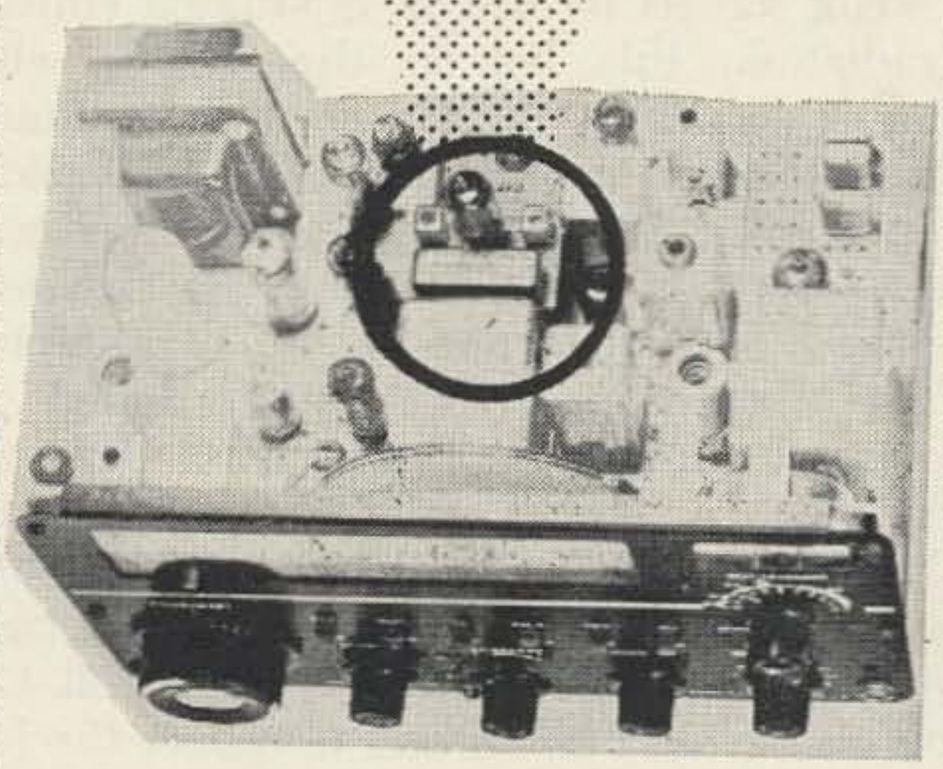

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Overall view of maser tube.

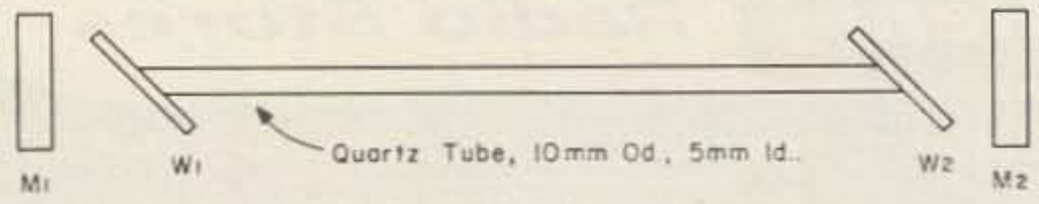
Richard Solomon W1KSZ
47 Withington St.
Dorchester, Mass.

The Beginning

A new dawn is breaking over that wonderful world called Amateur Radio. A whiff of that magical essence that inspired people as Hiram Percy Maxim, Sam Harris, and other such notable hams is wafting itself over the ham domain again.

This breeze carries the name; *optical maser*. This device, capable of carrying more information than now carried by all the services up to the highest television channel, is sweeping the commercial world like wildfire. In the past 2 years, more than 5 companies, entirely devoted to this branch of physics, have sprung up.

But first, a little historical background to this device. In the early 1950's, Dr. Charles H. Townes, then of Columbia University, along with his group formulated the idea of amplifying weak signals by use of stimulated emission of radiation, this led to the *maser*, which means, microwave amplification by stimulated emission of radiation. In 1953, Townes' group built the first workable microwave maser, using ammonia gas, but its frequency was fixed. In 1955, while in Paris, Dr. Townes got the idea of using a specially doped germanium as a maser, but it wasn't till 1956, that Bell Telephone Labs, and MIT's Lincoln Lab built the first solid-state maser. Then in 1958, in answer to Dr. Townes search for an infrared generator, Dr. Arthur Schawlow of Bell Labs suggested using two mirrors to reflect the light back and forth through the crystal, and the first optical maser, or laser, was born. The term laser stands for; light amplification by stimulated emission of radiation. But it wasn't until the summer of 1960, that Dr. Theodore Maiman, then at Hughes Aircraft Research Center, by using a piece of single crystal ruby rod got the first operational laser. This ruby laser was only a pulse unit. It took only 3 months for a group at Bell Telephone Labs, headed by Dr. Ali Javan, now at MIT, to produce the first operational CW gas laser. The gas laser therefore is our story.



$M_{1,2}$ — dielectrically coated mirrors
$W_{1,2}$ — end windows (optically flat and parallel)

The optical maser, hereafter referred to as the maser, is composed of a glass tube, preferably quartz or pyrex, about 10 millimeters (0.400") thick, and has two windows on either end. These are usually quartz, or some form of special glass made by Corning (7056, 7052). The windows are placed at a certain angle to the tube, called Brewster's angle. This has the effect of polarizing the beam passing through the windows. There are two mirrors at either end of the tube; these can be placed internally in the system, or usually, for experimenting, they are placed outside the end windows. These mirrors have the effect of the tank circuit in a transmitter: they determine the output frequency, and reject all other signals. The mirrors are coated with alternating layers of two chemical compounds, each layer about a quarter-wave thick. At 2.6 x 10^{14} cps a quarter wavelength can be mighty small (0.0000000000001 inch). The tube is then evacuated to a very high vacuum (10^{-8} Terr), and then filled with a mixture of helium and neon. The pressure and mixture are determined also by the output frequency, called the line at these levels. The tube is then carefully aligned and the mirrors aligned to almost perfect parallelism. An rf discharge is then coupled into the tube, and if everything is alright the tube should "mase".

Without going into Ph. D. type physics, the maser action occurs when the discharge in

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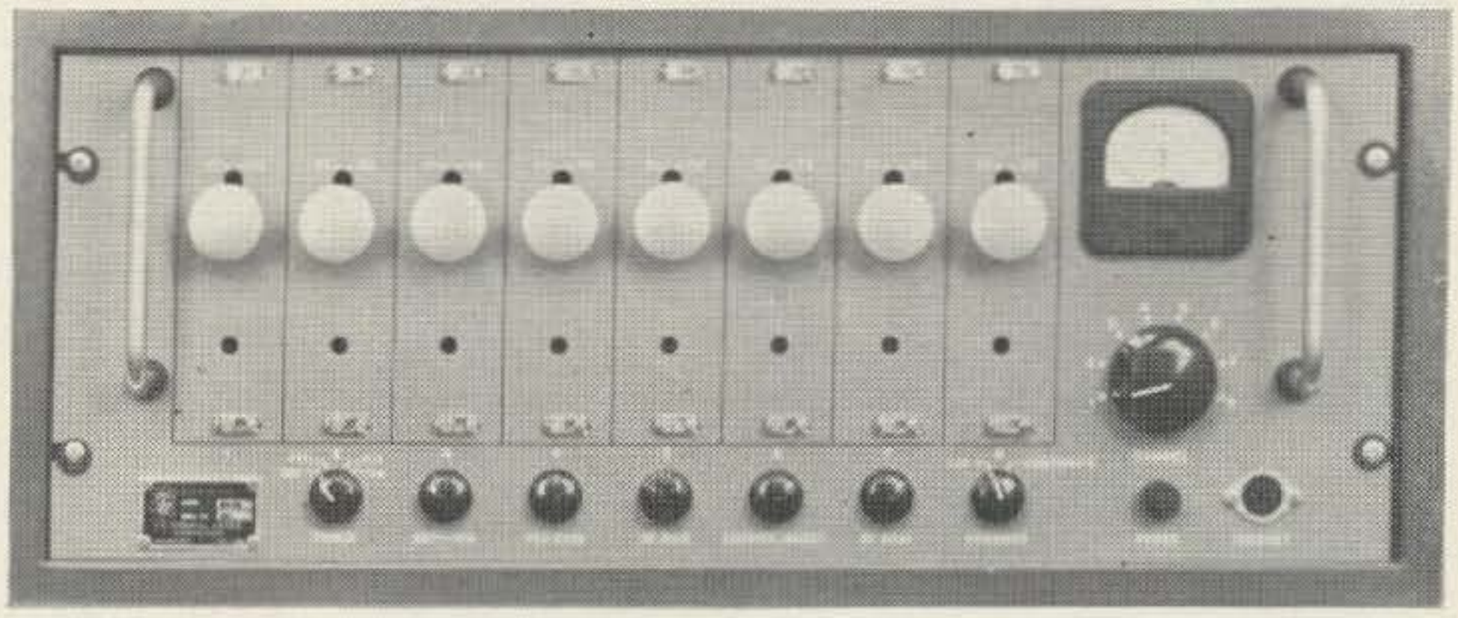

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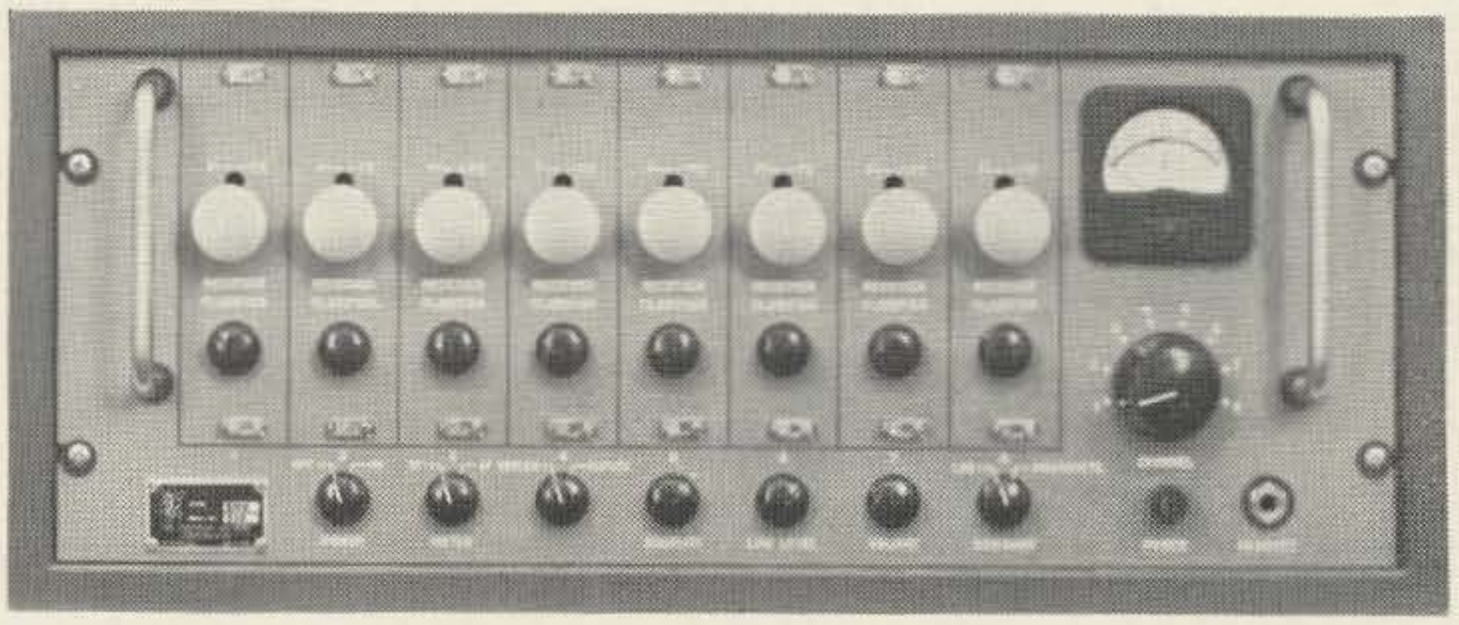

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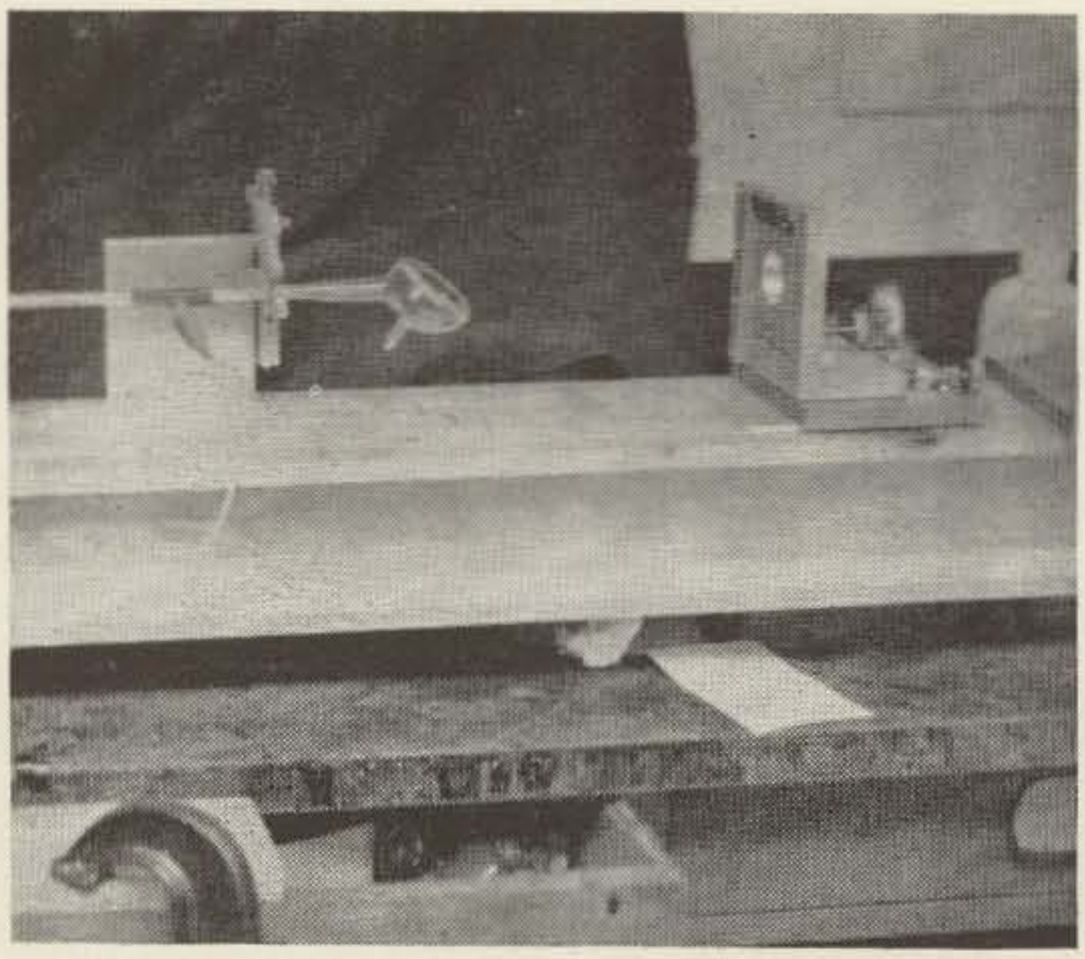


Closeup of end of tube, showing tube, end window and mirror on mount. The variable coils in the front are used to match the rf to the tube.

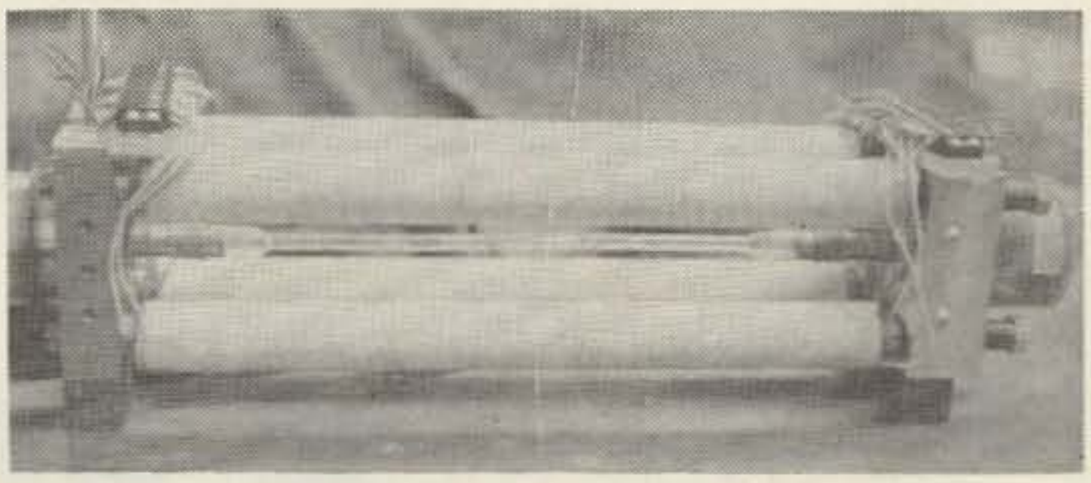
the tube causes the tube to show some energy gain in the form of light amplification from one end of the tube to the other. The mirrors then reflect this light back and forth, similar to positive feedback, until oscillation occurs. The maser signal then passes through the mirrors and out each end. The signal is now ready to be studied.

The output frequency of the maser, depending which mirrors are used, usually is one of 3 lines, or transitions, as they are sometimes called. They are; 1.153u, 3.39u, and the visible line, 0.6328u (u is microns, meaning 1u is 300 million mc). The stability of these units is dependent mostly on the geographical location. It varies from 1 part in 10^8 in noisy places to a present figure of 1 part in 10^{14}. Pretty good when you think that most vfo's are called "rock stable," if they are as good as 1 part in 10^6.

The "line width" as it is called, is similar to the "Q" of the final tank, in that it determines how much information can be carried by the single frequency, for example, say a Q of 10 on 50 mc. This means that the 3 db points are plus or minus 2.5 mc, or a 5 mc signal could be carried or used to modulate the transmitter final. The "Q" of the maser is about 3,000,000. This seems quite large, but with a center frequency of 264,000,000 mc, this is a bandwidth of 900 mc. Therefore on one maser signal you could carry all the information now transmitted, from the lowest loran signal through the highest TV channel, with plenty of room to spare. Quite a way to alleviate QRM.

So what, you say; big deal to modulate light, everyone knows how light scatters when it leaves the source. Think of the lens needed to concentrate the light, read on, me lads, all is not told yet. This light beam is *coherent* light. This means that the light does not scatter, that it comes out in one parallel beam, that with a small cheap lens the divergence of the beam is *zero*. This means that the beam could travel the length and breadth of the universe and not enlarge its diameter more than a fraction of an inch.

The modulation of the maser is another thing to contend with. How many ways are there to modulate something? You can amplitude modulate, frequency modulate or phase modulate. Amplitude modulation is by far the easiest. The author plans to use a piece of KDP (potassium dihydrogen phosphate) crystal, obtained by devious methods well known to hams, mainly the long lost art of "knowing the right people in the right places." This KDP crystal exhibits the phenomena of being able to transmit or block the passage of light by means of applying a voltage across the crystal. A simple 125 watt modulator, using a 30K 200 watt swamping load suffices to deliver the necessary audio power to modulate the maser beam. For reception of the maser signal, a photo-detector of some sort is needed. Anything from an elaborate gold-doped germanium crystal to some simple selenium photo-cell (such as the "solar battery") can be used. An audio amplifier completes the communications system.



Closeup of Highly stable maser. Four coils are wound around invar rods. The coils are for magneto striction tuning of maser.

DX on this band consists of how far away can you go, and still align the system properly. A mirror such as used in solar furnaces could be used to collect the signal, with the detector at the focal point. This would loosen the restrictions on close tolerence alignment of transmitter and receiver systems. Pulse maser signals, from a large rod made of ruby, have been used at MIT and Raytheon to bounce maser signals off the moon.

More sophisticated methods of modulation can be used to carry information on the maser beam, but require more delicate alignment

and high level electronic circuitry. A system of frequency modulation is presently being tested at MIT, and might be operational very soon. This is the field hams can have fun in.

To make one of these units just now, the cost would be prohibitive, but in a few years, the prices will drop sharply. For example, last year complete optical gas maser systems were selling for over $10,000; by June of this year, you could buy complete systems for under $1,000. This trend will continue, until the time when the ham will be able to get one of his very own, to play with and experiment with. Hams who know people in the optical world have a much better chance of being able to make one of these than anyone else. All you need is to know the right people.

. . .W1KSZ

How Good is your Receiver?

Joseph Marshall WA4EPY
Ozone, Tenn.

Receiver sensitivity is ordinarily measured in a shielded room with a signal generator and a dummy antenna. While this gives a useful absolute value it is not necessarily a measure of the practical sensitivity that will be achieved by the receiver in actual use in any given type of service.

We all know that the sensitivity of a receiver is limited by the total noise the signal faces at the input of the receiving system. This noise has three components: the noise generated by the receiver itself, the noise generated in the antenna by the motion of electrons within it, and the noise picked up by the antenna from space. The shielded-room" sensitivity includes only the noise generated in the receiver and antenna.

When a receiver is connected to an antenna in space, the antenna will pick up external noises and these will increase the total noise the signal faces. Hence the actual sensitivity of a receiver will be considerably poorer when it is in actual use than it is in the shielded room.

The noise picked up by the antenna will vary with 1) the frequency operation because the noise generated in space also varies with frequency; 2) the directivity of the antenna because the narrower the acceptance angle of the antenna the smaller the proportion of the total noise in space it will pick up; and 3) finally, with the receiving location because noise, especially man-made noise, will vary from location to location.

Because of these variables it would be impossible for a receiver manufacturer to attempt to state the actual practical sensitivity of his receivers. However, you can quite easily determine how good your receiver is in your own location, and in the frequency range of your operations, by making some simple measurements and using the charts.

The equipment needed is quite simple: 1) a carbon resistor whose resistance is the same value as the input resistance of your receiver—50,72 or 300 ohms as the case may be; and 2) a vtvm or ac voltmeter capable of reading an ac voltage of about 1 volt. The procedure is as follows:

1) Disconnect the antenna from the receiver and connect in its place the equivalent resistor. Use the shortest possible leads on the resistor. If the receiver has a coax input, solder one end of resistor to the center of a coax

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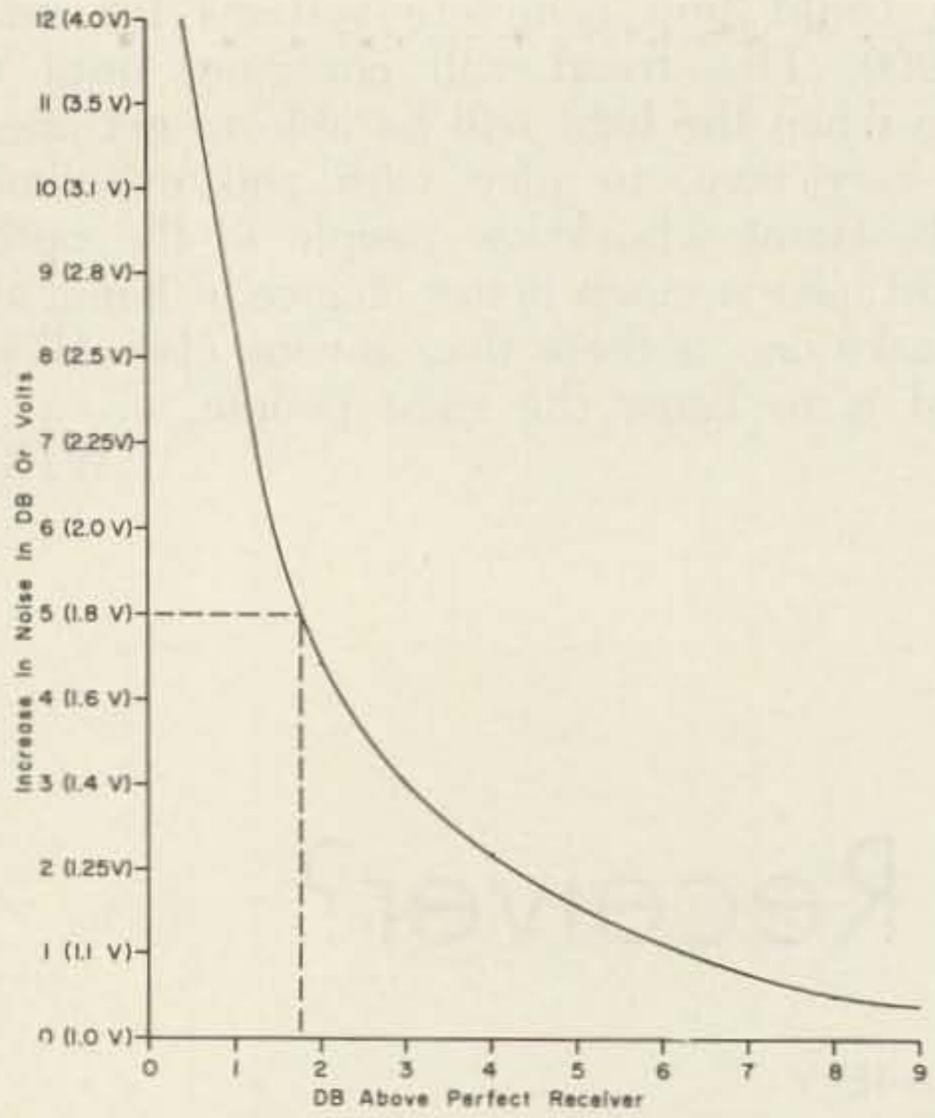

plug and the other end to the shield.

2) Connect the voltmeter to the headphone jack of the receiver. If it has no headphone output, connect it across the highest tap on the output transformer, or across the speaker leads. A more sensitive meter is desirable if the measurement has to be made across a 4 or 8 ohm loudspeaker since the voltage will be lower.

3) Turn the avc off, be sure the noise limiter is off, and turn the rf gain control all the way up. Adjust the audio volume control so that the noise voltage reads 1 volt or Odb, if the meter has a db scale. Because of the random character of the noise and shot transients, the meter needle will swing erratically about ½ to 1 db. Adjust the control so that either the maximum or minimum swing hits the 1 volt or 0 db mark.

4) Do not disturb the controls. Remove the resistor and connect the antenna to the receiver. Assuming your receiver has a reasonable noise figure, the meter will show some increase in the noise voltage. Carefully read the increase either in volts or decibels. If you adjusted the controls in the previous step for a minimum or maximum swing, be sure to read the meter in this step the same way.

5) On the graph of Fig. 1, along the vertical calibrations on the left, find the point that corresponds to the meter reading when the antenna was connected. Move horizontally along this line to the point where it crosses the curve, then vertically downward to the calibrations on the bottom of the graph. This will give you the difference in db in total noise, and therefore in sensitivity, between your receiver and an ideal or perfect receiver using the same antenna, at the same frequency and the same location. In other words, it gives you the improvement that you would achieve if you could get a perfect receiver to replace the one you now have.

Example: Let us suppose that when you connected the antenna in place of the resistor the meter reading rose from its original Odb or 1v point to 5db or 1.8 volts. Moving along the line that is occupied by 5 db or 1.8v to the curve and then down to the baseline we see that we get a reading of approximately 1.75db. This indicates that at that frequency and with the noise that the antenna picked up at that time, your receiver is only 1.75db poorer than a perfect receiver would be. Since 1.75db represents a ratio of about 1.222, this means that you would obtain an improvement of only 22% in sensitivity if you replaced your receiver with a perfect receiver.

It is a good idea to repeat these measurements at different frequencies, at different times of day, and with the antenna pointed in different directions if it is rotatable. Be sure to find a frequency within any given band that has no signal. This will be rather difficult below 20mc and above 3mc in the daytime. You may have to try the measurement late at night or in the wee hours. You will find some variation in the noise picked up by the antenna from day to day and depending on the direction your beam is pointed to. If the beam is pointed straight at the Milky Way or the sun, for example, the external noise will be very much higher than it is when the antenna is pointed at "quiet" portions of the sky; and, of course, your receiver would look much better than it actually is in the average direction and average time of day.

You will find that you get a pretty big variation in the reading as you move upward in frequency. Your receiver will be much closer to the perfect receiver below 20mc than above. In fact, below 20mc, most receivers, even inexpensive ones, will come pretty close to the perfect receiver. But as you go upward in frequency, and especially when you get above 30mc, you will find that your receiver is poorer when compared with the perfect receiver.

However, this does not mean that your receiver is less sensitive at the higher frequencies. On the contrary, it will probably be more sensitive. The useable sensitivity of a *perfect* receiver improves as the frequency increases. This is true because the noise picked up by the antenna decreases very sharply as the frequency is increased. The perfect receiver would be most sensitive–that is, capable of reading the

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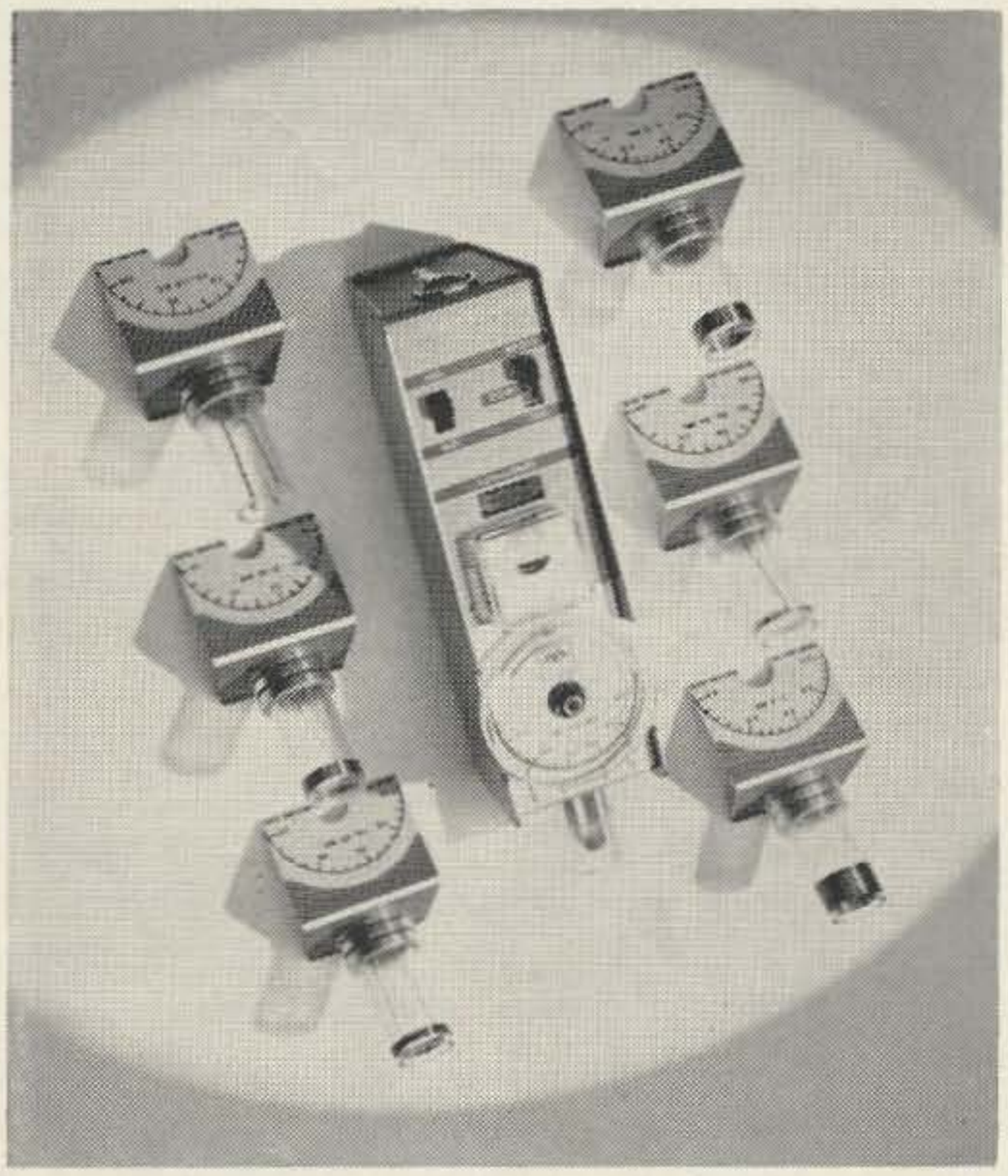

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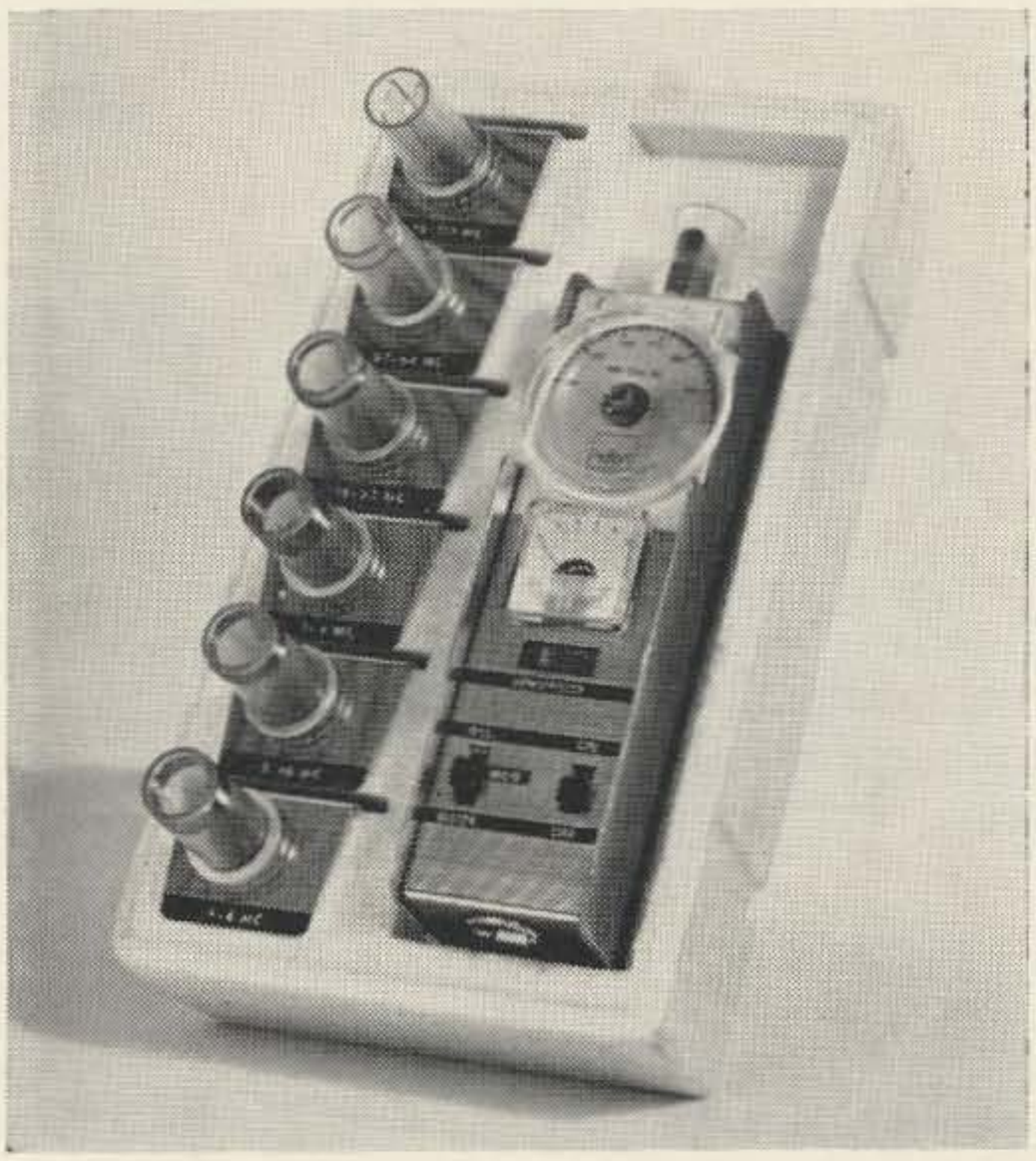

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Dummy (no offense) Load Wattmeter.

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weakest signal—above about 300mc. In this part of the spectrum the external noise is a small fraction of the noise generated by the antenna itself, and therefore the sensitivity approaches very closely the shielded room sensitivity.

On the other hand, below 10mc, the external noises are several times stronger than the antenna noise, and indeed several times stronger than the noise of most receivers. Hence, even if we could eliminate the receiver noise completely, there would still be enough noise to limit sensitivity to a relatively low value. The noise below 10mc will be so high most of the time that even a perfect receiver would require a signal of 1 microvolt or more for a 10db signal to noise ratio. On the other hand, above 200 or 300mc, the external noise is so low that if we had no receiver noise at all, we could read a signal as low as .1 microvolt. Unfortunately, it is much harder to approach the ideal receiver at the very high frequencies.

Generally speaking we can say that when a receiver used for voice or code communication—where the ear is involved as the sensing element—is 1db above a perfect receiver, there is no point whatever trying to improve it. First, the difference could not be heard (though it could be measured), and secondly, it would take the impossible jump to a perfect receiver to make any significant difference at all. For most purposes a receiver 3db poorer than the perfect receiver will represent a practical optimum. Especially above 100mc the cost of approaching the ideal receiver more closely becomes disproportionate as compared with the actual improvement in useful sensitivity.

Effective Filtering

or shut that thing off!

Jack Struthers W2OZY
Bracken Rd.
Morrisonville, N. Y.

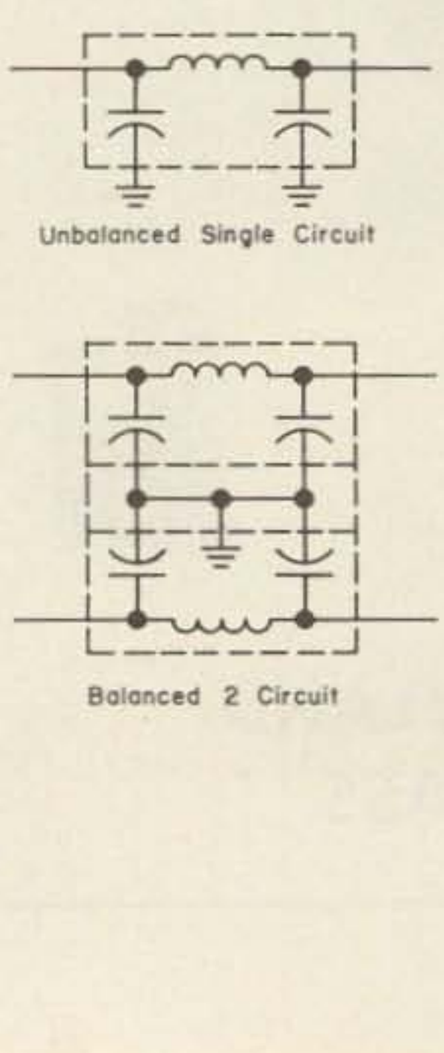
When the vacuum cleaner or the kitchen mixer is turned on, do you increase your bowling ball appearance? Does your Jr ops electric train develop a straight out feeling? If so, perhaps a few oft-missed points in the filter department might be good to review.

Interference types include atmospheric, static, precipitation static, background noise, cosmic noise and man-made noise. Any discussion of man's efforts to generate noise must include rotating electrical machinery (especially commutating types), ignition systems, breaker points (relays, distributors, etc.), pulse equipment, equipment intermodulation & cross modulation, diathermy, induction heating, welding, hum at power and audio frequencies and gas vapor ionization such as mercury vapor and thyratron tubes, fluorescent & neon lamps. How any of these man-made troubles get into our receivers depends on the degree and type of coupling which is defined as the means of transfer from one circuit to another. Coupling types are: Capacitive or electrostatic, inductive or electromagnetic, direct radiation and conduction.

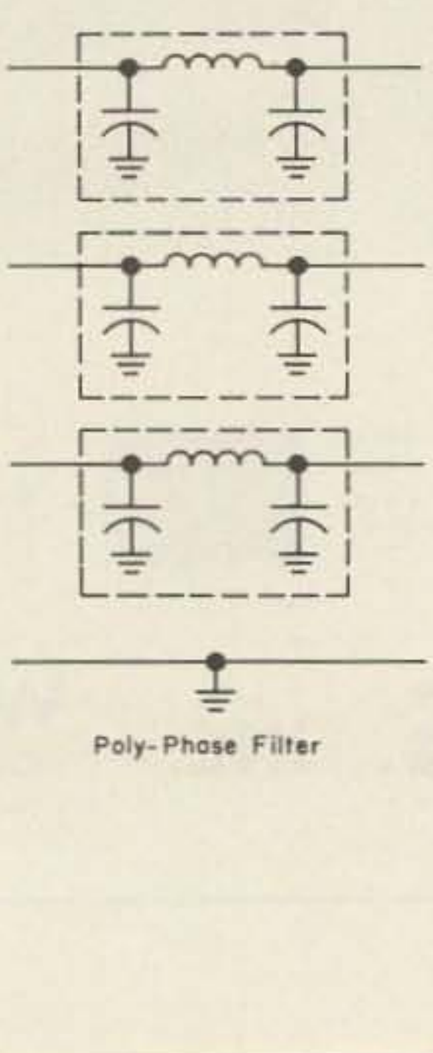
The simplest form of bypass for radio frequency energy is the condenser, and in our selection thereof there are four cardinal rules to be followed:

1. Never use an electrolytic condenser as a radio interference filter
2. Always use non-inductive type condensers
3. Use hermetically sealed condensers with one side grounded for values over .1mfd
4. For values under .1mfd, molded paper, ceramics or mica are suitable

Whenever a condenser will suppress the noise to the desired degree, it is unnecessary to use any of the more complicated filter systems such as "L", PI, or "T" types. Filter selection depends on the type of equipment to be suppressed and the amount of suppression desired. Factors important in filter selection are: rating, attenuation, voltage drops, maximum capacitance, insulation resistance and maximum test voltage. Uuless otherwise stated by the filter manufacturer, a filter safe test voltage should be at least twice rated voltage.


Unbalanced Single Circuit

Balanced 2 Circuit


Poly-Phase Filter

It is more often desirable to have the filter built in at the source of the noise since capacitive or inductive couplings may take place in a power or coaxial transmission line. Doing so will eliminate the need for much complex shielding and grounding to eliminate low level mutual coupling. Filter specifications common to but varying in importance in all filters are:

1. Voltage rating of the line in which the filter is to be inserted.
3. The maximum current which will pass thru the filter.
3. The duty cycle of the filter. This applies to decreased load current of intermittent operations.
4. The power frequency.
5. The tolerable ir drop at the power frequency.
6. Maximum operating temperature of the filter.
7. Band of frequencies required to be attenuated.
8. The amount of attenuation required.
9. Circuit requirements of insulation resistance.

Here are three types of power line filters:
Common Filter installation faults most often include:

1. Too long a ground return: This return might resonate at a frequency thus generating large radio frequency to ground and thus radiate.
2. Poor filter case grounding: Poorly cleaned ground surfaces. Since low impedance to ground is necessary poor case ground connection looses the effect of the filter capacitor.
3. Too long primary leads: As with #1 above will radiate if resonant at a radio frequency. Also separation of input and output leads is mandatory since filtering effect would be lost by "bundling" them.
4. Use proper size terminal connector to aid current flow.

It cannot be over-emphasized that a poor ground connection is the most common fault in many types of electrical and electronic filter installations. Receivers, transmitters, motors, generators, alternators, relays, switches, neon and fluorescent lamps are all potential sources of communications interference.

Now that I have scratched the surface, perhaps you will be able to make some positive progress in the elimination of man-made noise in your QTH. At the very least, the preservation of what remains of your wavy brown locks has been accomplished.

. . . W2OZY

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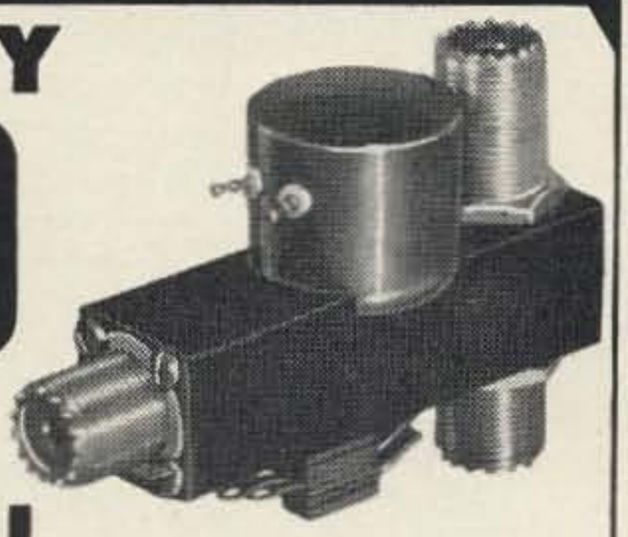

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A Two Element Phased Array

Introduction

The art of feeding antennas with multiple feed lines appears to be reserved for the commercials or the engineering text books. Too many times one hears an expression on the air indicating that a beam is a Yagi. While the reverse is true it certainly is not true that parasitic beams are the only kind, nor necessarily the best kind for a particular application.

Let's start by giving a few quotes from Kraus' book on antennas. If you have it refer to chapter 11. We will not bore you with the math but if you are interested get the book. Perhaps your library has a copy.

Section 4 of chapter 11 deals with two driven elements with equal currents of any phase relation. Referring to a 1/10 wave spaced antenna, Kraus indicates that the antenna gain is maximum at this spacing and nearly constant from ⅛ to ¼. However at and below 1/10 wave length spacing excess loss resistances occur, and larger loss resistances occur at considerably larger spacings. "A spacing of ⅛ wave length has the advantage that physical size of the antenna is less. However resonance will be sharper than for wider spacing."

Now what can we do with this line of reasoning in so far as the low frequency amateur bands are concerned? Obviously we want the maximum gain and front to back ratio available, but not the losses or sharp resonance condition referred to. This can be done to good advantage by the use of folded dipoles spaced to lower the "Q." It is of course necessary to match the impedances.

One other point before leaving Mr. Kraus—
No rotator is required and wind loading is minimized.
Third harmonic (15M) operation is feasible, but with a broader pattern.
Less height seems to be required for reasonable results when both elements are driven.
Horizontal pattern—broad, cardioid shaped.
Angle of radiation—low.

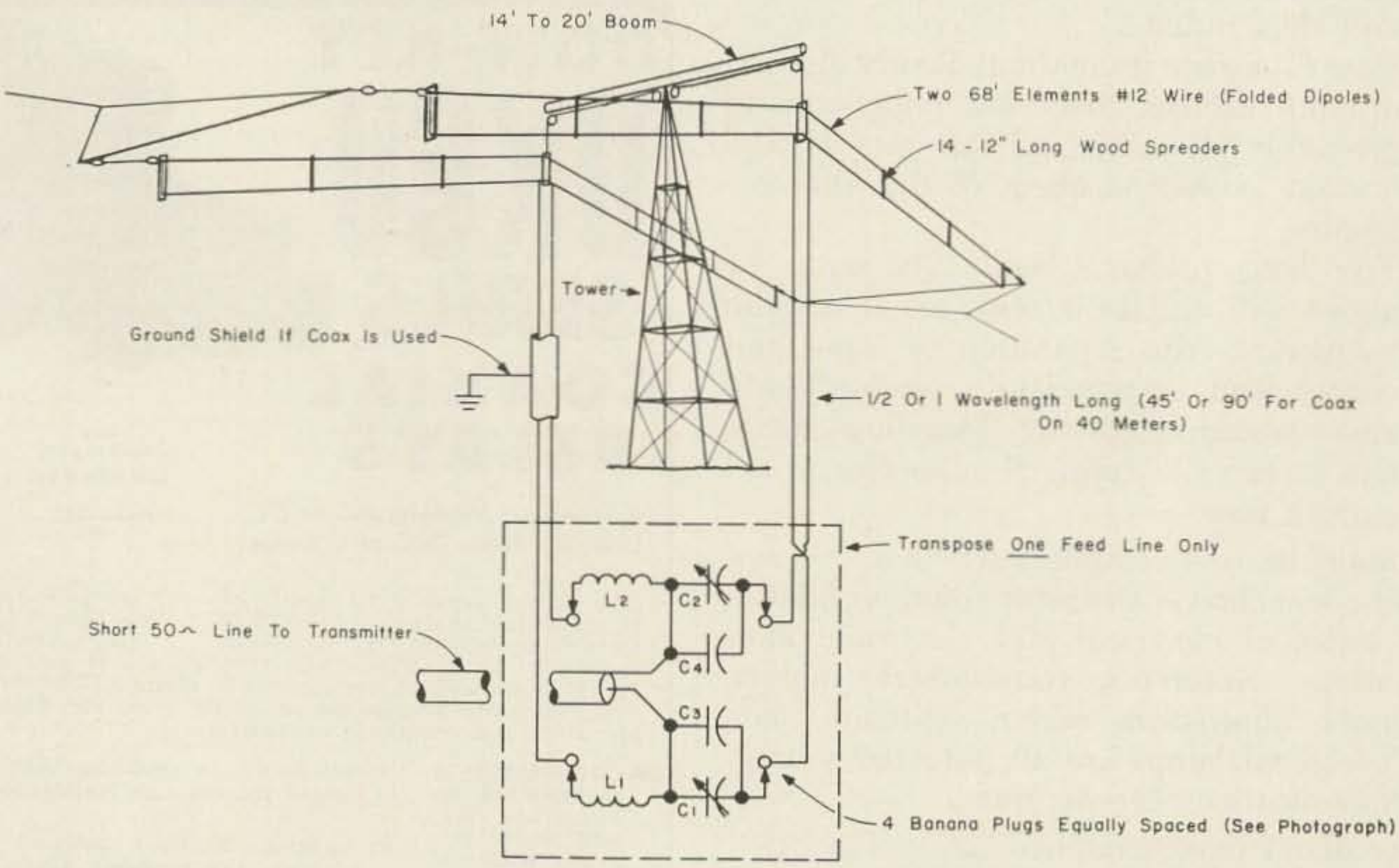
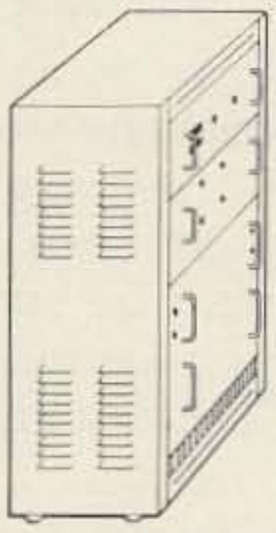

14' To 20' Boom
Two 68' Elements #12 Wire (Folded Dipoles)
14 - 12" Long Wood Spreaders
Tower
Ground Shield If Coax Is Used
1/2 Or 1 Wavelength Long (45' Or 90' For Coax On 40 Meters)
Transpose One Feed Line Only
L2
C2
C4
C3
L1
C1
Short 50~ Line To Transmitter
4 Banana Plugs Equally Spaced (See Photograph)

FIGURE 1

L_1-L_2—9T 1¼ dia.
C_1-C_2—100 mmf variable
C_3-C_4—.0003
Freq.—40M, resonate C_1 C_3 L_1

Approximate values are for 40M and 150° phasing. Feeders are small coax with shields tied together to form twin lead—or 150 ohm twin lead.



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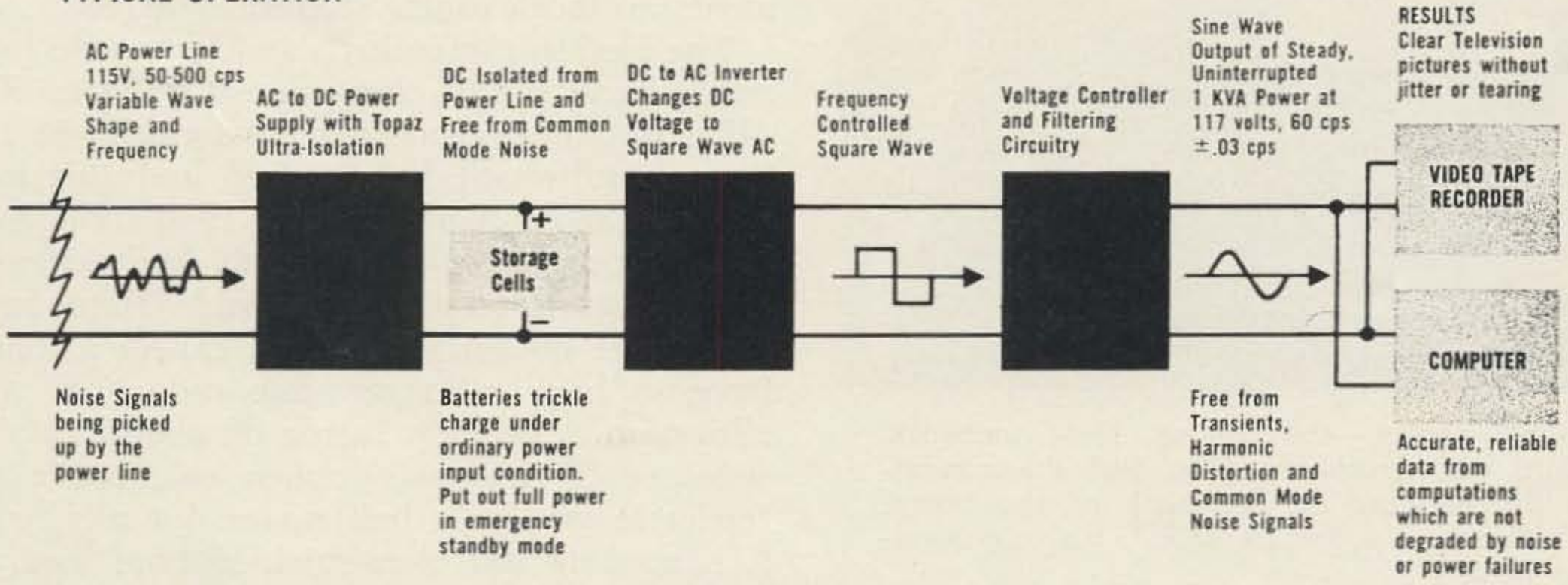
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although dealing with phased vertical antennas he indicates that at ¼ wave spacing maximum front to back ratio occurs if the elements are connected 90° out of phase. At ⅛ wave spacing it is maximum at 135° and if we project these we find that at 1/10 wave spacing we should use 150° phasing.

The Antenna

This antenna has been in use at W7RTP for about six years. In its original form it was described in QST (December 1956). It has given an excellent account of itself on 40 meters for those who erected it. However, experience is a great teacher and the following version has evolved.

The characteristics of the beam on 40 meters are as follows:

SWR—less than 2-1 for a band width of 255 kc.
Front to back ratio is about 20 db.
Power gain is probably about 5 or 6 db.
Input impedance—50 ohms (approximately).

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Maritime Mobile operation is available from the Hotel's 76' off-shore charter boat or the 42' sport fisher, using Collins gear.

There is no charge for the use of radio gear. QSL cards will be supplied and mailed, and confirming cards forwarded also without charge.

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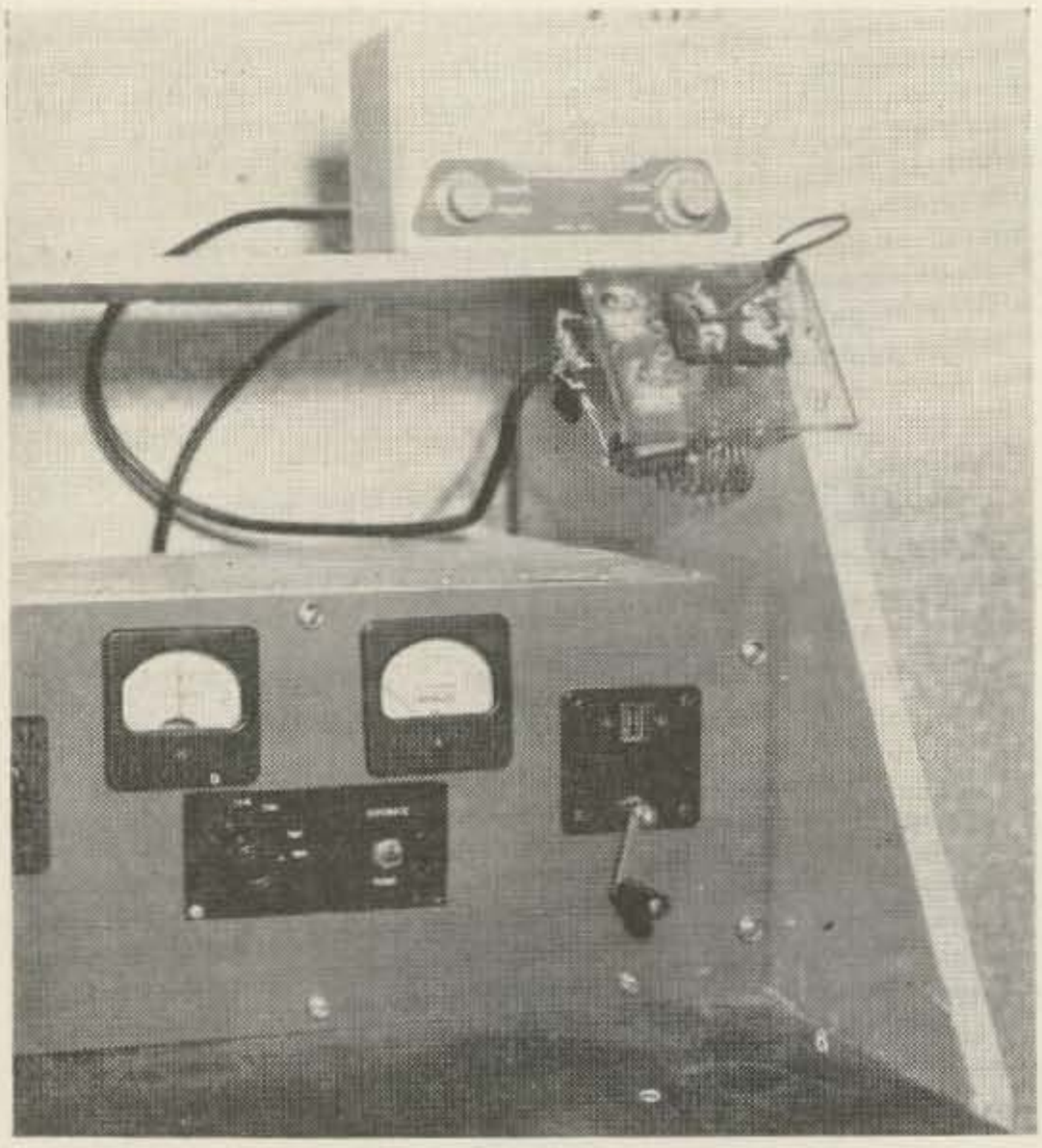


Right center—the phase shift network. Note the removable plug and the components mounted on the back of the board. The linear is a pair of 4X250 B's in grounded grid.

Balanced feed is used to low Q elements. As shown in Fig. 1 the antenna consists of two open wire folded dipoles ½ wave long, spaced about ⅛ wave apart. They are in the form of inverted "Vs" for mechanical convenience. Of course they could have been mounted in any manner suitable to the location.

The tower supports the boom which should be ⅛ wave long (or more) and has an aircraft pulley mounted on each end and two near the center as shown in Fig. 2. A ⅛" flexible aircraft cable supports the elements and after passing through the pulleys is secured at the bottom of the tower. The length of each cable should be twice the height of the tower. This arrangement makes it easy to raise or lower either or both of the elements in a matter of seconds. Caution—don't use a smaller cable, it may jump off the pulley and jam.

The ends of the elements are supported by a yoke as shown in Fig. 1 and photo. There does not appear to be much sacrificed by reducing the end spacing slightly so our yoke is a 10 ft. long piece of 1" aluminum tubing located about 10 ft. beyond the element ends. Each element should have at least two insulators at each end as shown.

The two center support insulators are shown in Fig. 2. They are made from a ¾" wooden dowel or old broom handle. They should be soaked in linseed oil or boiled in paraffin. No paint! Same for the twelve ½" dowel spreaders. In as much as there is no difference in potential at these locations wood provides good results and is light in weight.

The elements themselves can be made from #12 or #14 antenna wire and are ½ wave long; in our case 68' is required for a center frequency of 7225. The formula $L' = \frac{490}{F\ mc}$ seems to apply. Note that this is the formula for a reflector in a parasitic beam. Be sure the elements are both exactly the same length.

The feeders preferably should be made from small dia 50 or 75 ohm coax. (RG58 or 59.) (Use 75 ohm if spacing is greater than 18 ft.) Four lengths will be required and this may cost you more than you care to spend. If so, *you can use 150 ohm T.V. twin lead with reasonably good results.* (Available from large mail order houses.) But don't expect as much front to back ratio or noise reduction. Also allow for a velocity factor of about 72 (instead of 65 for coax) when calculating the feeder length for a half wave. Actually, what is needed is 100 ohm shielded twin lead. In as much as the power is divided between the 4 lines there are few losses and plenty of power handling ability.

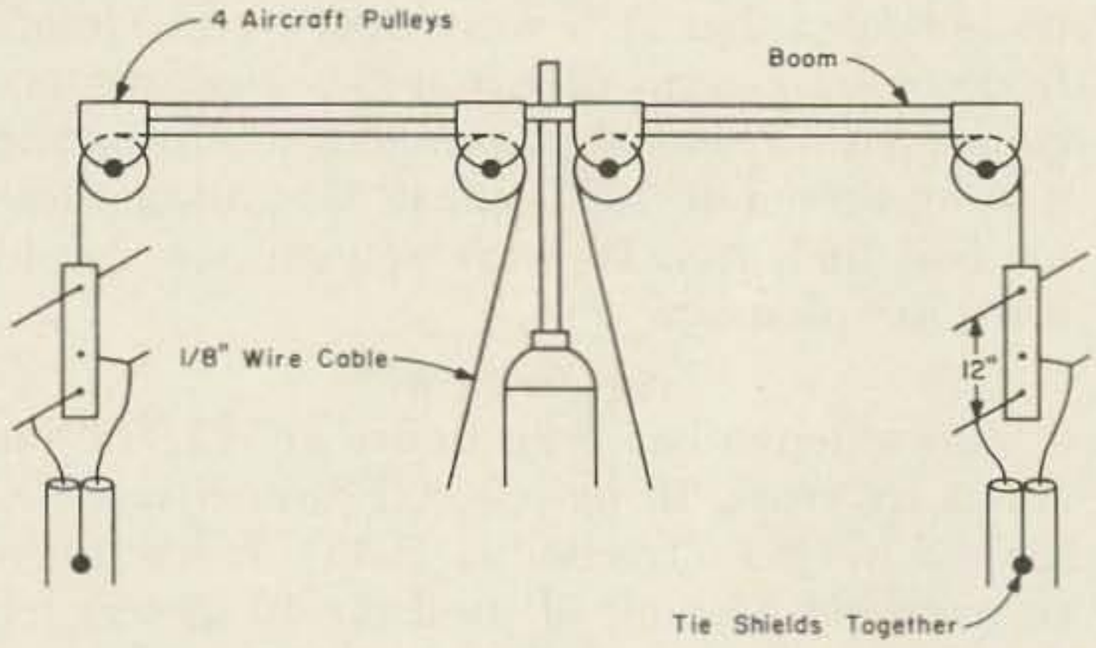
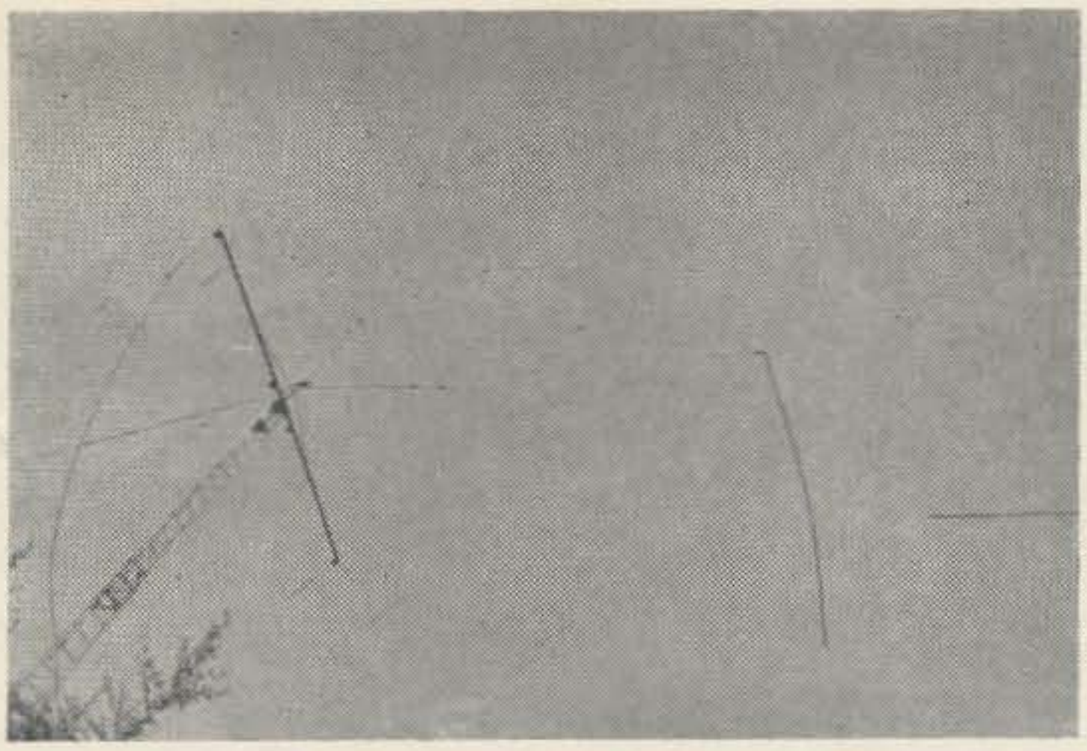


FIGURE 2

If you elect to use coax, take a pair of them, either ½ or 1 wave long, and tie the shields together at both ends. Ground the bottom end. Do the same for the other pair. Connect the center conductors to the antenna as shown in Fig. 2. The bottom end of the center conductors are connected to the phase shifting network plug. A short length of flexible twin lead should be used to facilitate changing the plug. Be sure to transpose one feeder as indicated and keep them both exactly the same length.

The directivity is changed in the phasing network by adding or subtracting about 30° from the 180° given by the transposition of the feeders. (See photo) Obviously if a bidirectional pattern (like the old 8gk) is desired,



2 element 40 meter wire beam shown with ground plane. Note the long spring at right to compensate for tree movement in wind. The ground plane has been replaced with a two element rotary.

the network can be omitted for 180° phasing. See Fig. 1. The two series circuits (C_1 C_3 L_1 and C_2 C_4 L_2) are resonated by rotating C_1 and C_2 while watching for a dip in the reflected power as shown by an SWR meter. Every ham should have one!

The value of C_3 and C_4 will depend somewhat on the feeders. Approximate values can be found by temporarily connecting the open ends of series circuit together to form a parallel circuit and grid dipping them to frequency. The main thing is to keep each side equal. The values shown will result in a phase difference between elements of about 150° which is about optimum. Good quality receiving components are sufficient even with a kw because of the low impedances.

The two series circuits are located on a small circuit board and connected to 4 banana jacks that are symmetrically placed. Four banana plugs with similar spacing are placed on another small block and the feeders attached as indicated. Reversal of the plug reverses the beam. W3CTN does this with a 4 pole relay remotely located. Perhaps this could be used to eliminate the four coax but remember you have to get at the phasing network to adjust it. Once set it needs no further attention.

This method of phase shifting has been found to be more effective than using different lengths of feed line.

In discussing tune up procedure it should be mentioned that to check the resonate fre-

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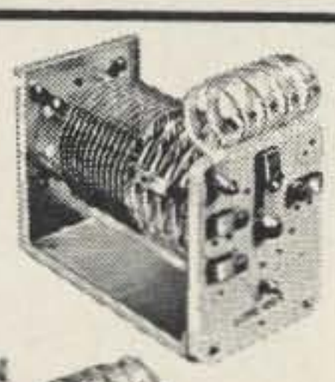
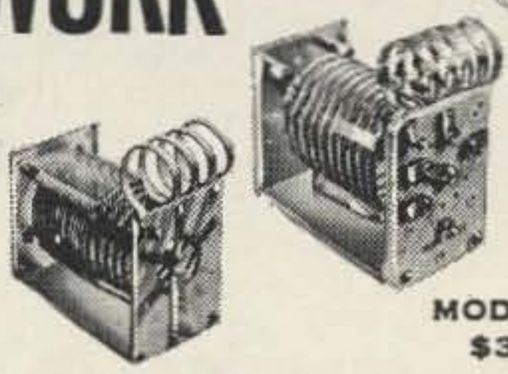


PI NETWORK COILS



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quency of the elements an antenna impedance bridge or grid dip osc. is connected to the bottom of one feeder. Be sure to short the unused feeder with a small resistor of 100 ohms (equal to the line impedance). Otherwise there will be considerable error introduced. Then repeat for the other feeder.

It may be advisable to use this procedure to correct the length of one or both elements especially if surrounding objects are in the field, as in the case of a low antenna. Actually, there is nothing very critical and most anything close will do a fair job but the extra effort will be rewarding.

Now a word about harmonic operation. It will not work on the even harmonics, only the odd. Therefore it does a fair job on 15 if cut for 40. Due to the increased spacing (⅜λ) on 15 however, the impedance will be off somewhat unless we insert a 15 M parasitic reflector midway between the two 40 meter elements. This can be attached directly to the boom in typical "plumbers delight" construction.

While this antenna has only been used on 40-15 there is every reason to believe that it should be excellent on any band. A set of four traps would make an interesting 75-40 project!

The antenna has worked its share of DX but the big advantage is in its reduction of noise, QRM, and ease of construction. The wire elements will perform just as well as tubing unless you insist on rotation.

It should not be confused with the 8JK or ZL special. There are numerous variations possible, i.e. the use of twin lead for the elements, ¼ wave spacing with 300Ω twin lead feed, etc., but the best results were obtained with the arrangement presented and a good impedance match is given to the transmitter without a coupler.

. . . W7RTP

Europe on $2000 a Day

W2NSD/1

October 6th came around, ready or not, Virginia had the November issue on the presses and I had a folder of letters and cables from hotels and hams assuring me that everything was go. My folks, who had been talked into volunteering as baby sitters for the next three weeks, picked up our six months old daughter Tully. I breathed a sigh of relief, thinking of the suitcases of clothes and diapers this would save Virginia carrying through Europe.

Though the drive to New York was as long and tiresome as ever, we arrived early, armed with travel brochures, name badges for everyone, a big carton of tickets, cameras, suitcases, flight bags, and confidence that everything was all set. What dreamers!

The BOAC jet trip to London was smooth and they did turn out the lights for a few minutes between dinner and breakfast so we could put our full attention on just how uncomfortable seats with restricted leg room and people packed elbow to elbow can be.

Suddenly we were in London and I was staggering out of the plane, festooned with carry-on luggage, an epic in wrinkles, my bloodshot eyes squinting our from behind the

sandpaper stubble of four-AM shadow. Somehow Sylvia Margolis, 73 authoress and XYL-G3NMR, recognized me and waved. Her first cheery words were, "Well, I see you made it alright, but where are your busses?" I rushed to a phone and called the hotel. "We thought you would do better to take the regular airport busses into town and then all take taxis to the hotel." I looked helplessly at their letter promising busses hanging limply in my hand. hanging limply in my hand promising busses.

Fortunately the bus company was accomodating and put on a couple extra busses, delivering us right to our hotel.

London is an excellent first stop on a tour of Europe because it introduces a newcomer to the European hotel system without making it even worse by adding a language barrier. Their hotels are different than ours, very different. Those that had read the recommended text, "Europe on $5 a Day," had little problem. They already knew what to expect . . . the water closets with paper that you bring home to prove you aren't lying about the choice between waxed paper or sand paper . . . the bath tubs that require an athlete to master . . . the "raw" bacon for breakfast . . . the slightly colored hot water they bring when you ask for tea . . . and a host of other litter surprises.

We were very fortunate to have only two grumblers on our tour. Not bad out of a total of 73, eh? I was proud of our group. With but the twe exceptions they were game for anything and as nice a bunch of people as you could ask to travel with. Hams are, with but few exceptions, way above the average in niceness.

The number one grumbler was Hank. He spent a good deal of the trip plastered, staggering from one person to another complaining about anything available. He kept bragging about being a world traveler and we eventually found out what it was all about. He had been in the Navy and visited a number of ports in the old Navy fashion. He was still at it, getting drunk in every port and bragging loudly about his old conquests, much to his poor wife's distress. He just never grew up.

While most of the group set about seeing the sights, Virginia set about finding an Italian Greyhound. She was determined to bring back a souvenir which we wouldn't forget. For two days she fed thrupences into the hotel phone all day long. Then my worst fears were realized, she found one. We picked it up Wednesday noon. Have you ever seen an Italian Greyhound?

This unbelievable slip of cuteness stands almost 12" high and looks like a miniature

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300-D	144-148	50-54	$10.50 ppd.
300-E	144-145	.6-1.6	$10.50 ppd.

300-X Choice of 1 input freq & one output freq between .6 & 160 mc ..... $14.50 ppd.

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All above converters are supplied with Motorola type connectors. For two SO-239 connectors instead, add 75c. N.Y.C. residents add 4% sales tax.

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Weatherproof coaxial relay for remote switching of r.f. sources. Designed for mounting on mast and remote switching up to 3 antennas. Not a rotating or stepping switch. Simplify installation, save money by running one cable instead of several to your antenna array.

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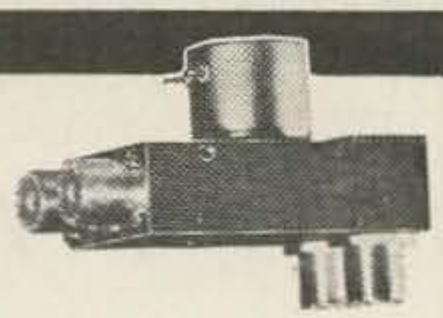
DOW-KEY

DK2-60B

NEW COAXIAL TRANSFER SWITCH



A DPDT unit internally connected in the de-energized position, ideal for switching in and out a power amplifier between an exciter and an antenna.

1 kw power rating to 500 mc; VSWR 1.15:1 to 500 mc; Isolation 60 db @ 1 mc; All standard AC and DC coil voltages available.

See your dealer for catalog sheet or write:

DK2-60B with UHF Connectors ... $19.00
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(BNC, TNC, N and C slightly higher)

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G2AHL, G2MI, G31IR, & G3BVG of RSGB.

greyhound. It bounces all over the place and collapses in a quivering jelly of ecstasy when petted. Although almost unknown in the U. S., there are a few of these being bred in Europe.

The hamfest came off as planned with almost a hundred U. S. and English hams and wives jammed into a restaurant for a typical fish and chips dinner, wine, speeches and a constant popping of flashbulbs as everyone took pictures of everyone else. Quite a few G's invited out to their homes for dinners and we all enjoyed this immensely. Sylvia, not content with setting up the hamfest, also had groups out to visit her and OM Morris G3NMR in the evenings.

Edgar Wagner G3BID was kind enough to treat Virginia and me to a magnificent dinner, complete with rare vintage wines, practically an obsession with Edgar. We shall never forget that dinner.

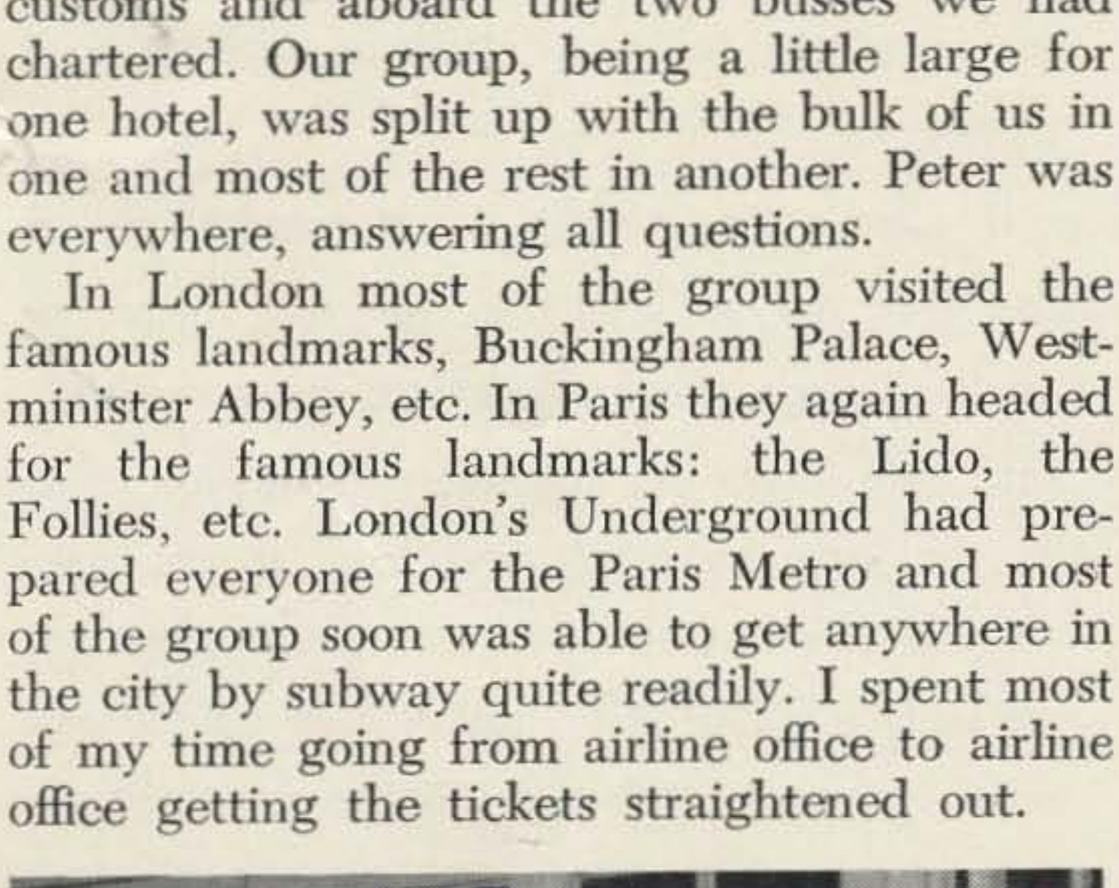
A luncheon with the top brass of RSGB convinced me that the British amateurs are in good hands. I was very pleasantly surprised at how clearly they understand what is happening over here at present. The RSGB offices are a lot like ours, with a small group of hard workers doing the work of three times their number.

The four days in London were up, seemingly in a few hours, and we bid goodbye to our friendly hotelkeeper as we left in two big BOAC busses. There was a quick flurry at the airport as I discovered that it was impossible to let everyone hold their own tickets. Some had them packed in their suitcases, some fellows handed in theirs, but not their wives, and one person suddenly announced that she had never gotten a ticket back in New York. This was all complicated by everyone wandering all over the huge terminal and us having to hunt high and low every time a ticket was wissing on the list. We held up the plane about fifteen minutes, but we all finally made it aboard.

During the hour jet flight to Paris (BEA

Caravelle) we got out our phrase books and prepared. As we stumbled off the plane we were met by a group of French amateurs, led by Pierre F2BO. We were given an indoctrination talk on Paris by Peter and then led through customs and aboard the two busses we had chartered. Our group, being a little large for one hotel, was split up with the bulk of us in one and most of the rest in another. Peter was everywhere, answering all questions.

In London most of the group visited the famous landmarks, Buckingham Palace, Westminister Abbey, etc. In Paris they again headed for the famous landmarks: the Lido, the Follies, etc. London's Underground had prepared everyone for the Paris Metro and most of the group soon was able to get anywhere in the city by subway quite readily. I spent most of my time going from airline office to airline office getting the tickets straightened out.



F9VR W2NSD/1 F8TH

Everywhere we went we ran across hams from the group . . . shopping in the department stores, on the Metro, at the Flea Market (where we bought eight fantastic tapestries and a suitcase to carry them in), in restaurants, and on the Champs. Pierre arranged a small hamfest for us and we all enjoyed talking with the F's. Some of us wrangled tours of the city and dinners and learned a lot more about Parisian life. I had a delightful dinner with M. Robert Brochut F9VR, the President of the R.E.F.

Pierre was everywhere. He drove several of the group out to Versailles, he drive or escorted many others to

Pierre was everywhere. He had been able to get a few days off from the army and turned them over to our group completely. He drove people around, took them sightseeing, helped

(Turn to page 70)

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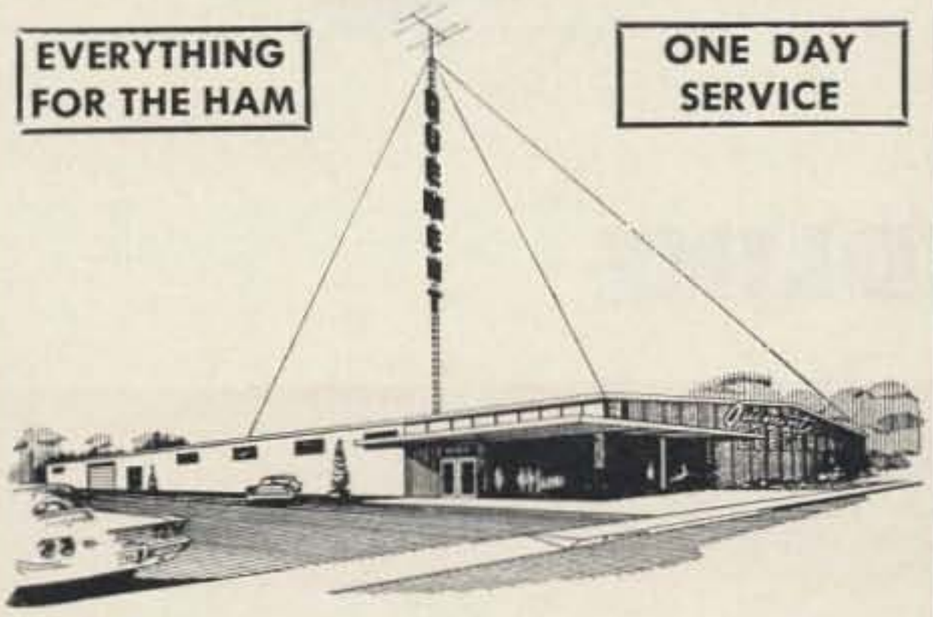

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IT'S TOO LATE NOW

We're building our Redline Converters just as fast as we can, but we can't possibly get one to you in time to slaughter everyone during the January VHF Sweepstakes. You'll have to take your drubbing from the fellows who already have their Redlines.

There is a possibility that we might be able to get one to you in time for the June VHF contest, unless things get even more hectic than they have already. We are building, testing, hounding the devil out of parts suppliers, packing and shipping the Redline Converters. The DGC models are taking us longer to make than we figured, but we're cranking them out. We wouldn't blame you if you didn't want to wait for them, but if you do the price is still $98.50, though we're a little worried about that price now that we've been making the units and found out what they cost us to turn out. The parts are bad enough, but the labor involved in those hundreds of little details is murder. Perfection is darned difficult . . . and expensive.

Quite a few fellows have written in for details on the Redline converters. While we appreciate the interest, we must apologize for not following through. The truth is that we have been so busy making converters that we haven't yet even printed up a poop sheet, and none is planned for the near future. Apparently our money back guarantee that our Redline Converters will outperform anything else available at any price tells the story clearly enough for most VHF'ers.

If, after a short period of self examination, you find that you are excitable over long deliveries, emotionally upset over paying $100 for a converter, don't care if you can hear every lousy little signal on the band, and don't even care if you make everyone else sick as you casually mention that you are using a Redline DGC, then we have just the converter for you: our HJC model. This darb, though not as hot as the extravagant DGC jobs, is better than anything else you can buy and the price is very right. HJC-50 is $31.95; power supply for same, HJS $9.95, though you can easily steal the piddling amount of power it needs from your receiver. The HJC-144 comes with power supply built in for $49.95. Both have 14-18 mc output.

The more obstinate may indulge themselves in our DGC-50, DGC-144, and DGC-220 with any i-f output desired for a mere $98.50. The DGC-432 is $119.50. A power supply for these critters is $59.50, including line cord.

DGC

HJC HJS

REDLINE

JAFFREY, N. H.

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CESCO CM-52 SWR Bridge and Indicator	19.00
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Gonset G-66B and 3 way supply	89.00
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Hallicrafters R42 speaker	9.00
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Hallicrafters SR-150 P-150 AC P-150 DC & MR-150 Complete package	599.00
Hallicrafters SX-25 Receiver & Speaker	59.00
Hallicrafters SX-99 Receiver	79.00
Hallicrafters SX-110 Receiver & Speaker	109.00
Hallicrafters SX-111 Receiver (demonstrator)	189.00
Hallicrafters SX-140K Receiver kit (new)	79.00
Hammarlund HQ-180C Receiver (demonstrator)	319.00
Hammarlund HX-50 SSB Transmitter (demonstrator)	299.00
Hammarlund S-100 Speaker	9.00
Hammarlund matching speaker for HQ-129X	5.00
Heath DX-20 CW Transmitter	24.00
Heath DX-100 AM-CW Transmitter	119.00
Heath MR-1, MT-1 & MP-1 complete mobile package	125.00
Heath UT-1 Utility AC Supply	19.00
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Stan Burghardt
WØBJV

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Koss SPA-202 Stereo Phones (new) reg. $29.95	12.00
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ALL ITEMS SUBJECT TO PRIOR SALE

(Europe from page 67)

them find special things they wanted, etc. When we were leaving Paris for Geneva and were split into two groups because the Caravelles were a bit small to hold our entire group plus other passengers, Pierre escorted one group and his mother the other. I was so impressed by Pierre that we are going to import him to New Hampshire to work with us at 73. How's that for a souvenire? Not only will Pierre be helpful in running 73, but he will be marvelous as a tour director for future tours with his familiarity with just about all of Europe, plus his command of English and French.

We ran into our first serious hotel difficulties in Geneva. That really had me sweating for a while. We'll go on from here next month.

The weather was beautiful, sunny and warm, except for our first day in London when it drizzled off and on. We never needed an overcoat for the entire trip, save possibly for the nights in Berlin.

We were very fortunate on baggage. When you travel in a group it is possible to have them weigh all of the baggage in a lump and avoid the penalty for overweight. We were permitted 44 pounds. Virginia and I started out with 80 pounds and added suitcase after suitcase as the souvenirs added up until we ended up with about 200 pounds. No extra charge. We came back with 350 pounds last year.

The $2000 a day? That's about what it costs to keep 73 people going on an all-expenses (except lunch and dinners) tour of Europe. Hoot mon!

(W2NSD from page 16)

Working for 73

This summer we had six fellows come in to work for 73 during their vacations. Most of them had never been away from home before and this was quite an experience for them. We had lots of work for them too. In addition to little jobs like setting the table, washing dishes (a new experience to a few), cleaning house, feeding the horses, ducks, geese, goat, and other pets, there were 73-type things like collating pages of our bulletins on ham television, the 73 newsletter, and our new 6UP VHF magazine. Then they had to fold the magazines, staple them, address and mail them.

They learned all about working fourteen hours a day seven days a week. They learned all the inside information on ham manufacturing, ham publishing and even how our hobby is being run. Few amateurs know what is really going on, there are just too many things that can't possibly be published.

Just as the summer started we managed to acquire a little house way up on the highest mountain in southern New Hampshire. Our summer team painted the house, cleared all the trees and set up a truly magnificent bunch of towers and beams. The finished product will consist of a three element full size twenty meter beam up 60′ on a tower, a 16 element colinear up 60′ for six meters on another tower, a 288 element two meter beam up 120′ on another tower, a 32 element 220 mc beam up 100′ on another tower and a 192 element beam up 110′ on a fifth tower. Eventually we will probably have a tribander and a quad on two more towers. The rigs didn't go quite so well due to all the other work . . . but we did manage to keep a Clegg Thor on the air just about every night from up there plus all through most six meter openings. The lower frequencies got plenty of workout with all those hams on hand too. The fellows worked late into the night filling out QSL's.

Each of the six fellows had his own distinct personality. Some were fine, some difficult. One chap didn't last very long . . . within a few days he had everyone furious with him and we had to send him packing along. He had something thoughtless and sarcastic to say about everything that happened. He knew all the answers, acted like a kid and hot rodded around. Work? Forget it.

Then there was Jerry. Jerry was from a little town in Iowa and as square as they come. His eyes were wide open with amazement at everything. He was an epic in carelessness. He managed to step into the tower hole filled with wet cement, a two foot square hole in the middle of four acres. When he painted it was everyone for himself . . . paint sprayed everywhere. Our goat turned blue during the blue painting, white during the trim work and black while the shutters were being painted. Jerry was a surrealistic masterpiece when he took off his shirt. He tripped over anything, spilled any food you passed him, walked in mud or anything left behind by our pet department and tracked it unknowingly through the house. ATV Bulletin subscribers may wonder at the strange page arrangements we sent out in July. We found out that this was not quite up Jerry's alley. Jerry would hold a soda in one hand and tip it over on someone next to him trying to eat a cracker in the same hand. We got so we didn't notice after a while. Then there was the dinner when we served

his plate in the kitchen, chicken cacciatora. Jerry got it to the table, but then flipped the whole works onto the floor as he put down the plate.

But Jerry was really all right. He did manage to get most of the mountain house painted, though it took him all summer to do a weeks work. The real trouble was with Goat Boy. We named him GB.

GB earned his nick-name because of his penchant for trying to outbutt our goat . . . he usually won too. Both were exiled to the mountain house soon after their arrival as a protective measure for the rest of the crew. The goat, taught to butt by GB, was a menace to life and limb. GB, whose only accomplishment was the development of a relationship with the goat, depressed us and it was much better for morale to have him out of sight. We tried him on simple things like washing dishes . . . and he did a good job, but we all felt a little guilty as we went to bed at eleven and GB was still only half through with washing dishes. Somehow he was able to keep a half hour job going for five or six hours. An hour job could take days.

Oh, we enjoyed having GB around. Everyone liked him, as long as he wasn't around to exasperate with his slowness. We liked his little explanations for the constant disasters that enveloped him. He would come in with a sheepish look and say, "Heh . . . heh . . . had a little accident." Then, holding up a broken yardstick, he'd say, "Had this in my mouth and walked through a 30″ door."

Our boy has been working for six weeks, on a Vee beam for six meters. We made the mistake of publishing an article on the glories of Vee beams and this set him off. It only took a week to get the basic design worked out. This did present a bit of a problem, for it seems that he needed a 387.62 ohm quarter wave line to match the beam to our 200 ohm twinlead. GB made his own 387.62 ohm line by taking 450 ohm open wire television line and patiently moving one wire over about three quarters of an inch in the plastic spacers. One leg of the Vee went up without much trouble, but the other leg held him up. Trees in the way. Bib trees. Most of us would run the wire through the trees or put up something to hold it over them. GB worked out his own system. We now have a ten foot cleared path up through the woods for about 300 feet with about twenty one hundred year old pines lying chopped under the wire. Unfortunately GB got his angles a little bit off and we now have a

(Turn to page 74)

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***Amateur Band* SSB Specialist**

$379.00

Here is an SSB receiver that combines basic operating excellence with all of the extra features so important to the discriminating amateur. Full amateur coverage from 6 to 160 meters plus excellent electrical and mechanical stability are just the beginning. Hammarlund has gone *all the way* to make the HQ-170A a truly incomparable AMATEUR BAND receiver. Expanded vernier tuning plus multiple, selectable IF bandwidths, 2 meter calibration, an accessory outlet and system socket, and a flip-open top add up to make the HQ-170A FIRST IN ITS CLASS!

HQ-180A

***General Coverage* at its**

SSB Best

$429.00

Now . . . the HQ-180A, designed to meet the needs of the amateur and SWL for a modern GENERAL COVERAGE single sideband communications receiver. Continuous tuning from 540 kc to 30 mc combines with complete amateur bandspread . . . 80 through 10 meters, and inherent Hammarlund stability, sensitivity and selectivity result in true receiving perfection and flexibility. A linear product detector, vernier passband tuning, and a sharp slot filter ensure perfect SSB reception under all operating conditions.

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NEW EQUIPMENT built by a well known Manufacturer for railroad communications. This equipment is lightweight but rugged. Can be used as straight fixed frequency FM or converted to 2 Meter Ham Band. This is QUALITY EQUIPMENT (not military surplus) at ridiculously low prices . . . Set of three units $70.00

FM TRANSMITTER

Frequency: 152-165 mc FM
(Easily converted to AM)
P.P. 6146 output driven by 2E26, 5763 multiplier. Easily converted to 2 meters. Will run up to 90 watts. Final and multiplier lines silverplated for high efficiency. Requires power supply and will run FM as it stands or AM with additional modulation can be taken off many low frequency transmitters. 52 ohm output. Complete with all 9 tubes and diagram, less crystals and power supply.
9" H x 9" W x 16" D.
Wgt: 12 lbs. Orig. carton $24.95

FM RECEIVER
152-174 MC. DUAL CONVERSION

Selectivity: 6 db @ 17 KC
Sensitivity: 1 micro volt or less for 12 db s/n ratio.
Freq. Stab: ±.0015% from —30° to +70° C.
I.F. Frequencies: 9.5 Mc & 455 KC.

6AK5	RF Amplifier
6AK5	High Freq. Mixer
6BA6	High IF Amplifier
6AU6	Low Freq. Oscillator
6AU6	Low Frequency Mixer
6AU6	1st Low IF Amplifier
6AU8	2nd Low IF Amplifier
6AU6	First Limiter
6AU6	Second Limiter
6AL5	Discriminator Diode
12AX7	Squelch & Audio Ampl.
12AT7	Noise & Audio Ampl.
6V6GT	Audio Output Ampl.
12AT7	High Freq. Oscillator

Complete with tubes and diagram, less crystals and power supply.
9" H x 9" W x 16" D.
Wgt: 14.5 lbs. Orig. carton . . $29.95

POWER SUPPLY

Matching unit for Xmitter/Receiver. Built to operate the transmitter and receiver described at left. Uses Westinghouse "Fosterite" sealed, Hypersil core power transformer and choke. Uses 2 5R4GY tubes and 2 selenium rectifiers. Supplies the following voltages:

117v,	50-70 Cyc.
330v	DC @ 250 Ma.
280v	DC @ 125 Ma.
—26v	DC @ 10 Ma.
—6.3v	AC @ .7 Ma.
6.5v	AC @ 10 Amp

9" H x 9" W x 16" D.
Wgt: 25 lbs. Orig. carton . $19.95

POWER TRANSFORMER

Supplies all voltages in above power supply $5.95
Swinging choke (used in above power supply)
2.5 Hy @ 380 Ma.
8.0 Hy @ 25 Ma. $2.95

ARC-1 TRANSCEIVER (AM). 10 xtal controlled channels & guard channel. Freq. range: 100-156 Mc. Power req'd: 28v DC @ 10 Amps or build your own AC supply. Complete with tubes & dynamotor, less xtals. Good Condition . . $29.95

ARC-3. 8 xtal controlled channels. Freq. range: 100-156 Mc. Separate transmitter and receiver. Build your own power supply. Many xlent conversions have been printed. Complete with tubes, less xtals. Excellent Condition.
RECEIVER $19.95
TRANSMITTER $19.95

SCR-522. 4 xtal controlled channels. Freq. range: 100-156 Mc. Can be used as a single unit or separate transmitter & receiver. An old stand-by that has been well written up. Many conversions available. Good condition.
RECEIVER $12.95
TRANSMITTER . . . . . $ 9.95
COMPLETE W/RELAY RACK $24.50

EE-89 PHONE PATCH. We can now supply the EE-89 chassis which contains a hybrid coil & makes a beautiful phone patch. Complete instructions furnished. New Condition $1.75

COAX CONNECTORS

PL-259A	Male	$.39
SO-239	Female	.39
M-359	Angle	.59

10 for $3 may be assorted

ARC-5 TRANSMITTERS

For your SSB Rig, complete with tubes. Used, exc. condition.

FREQUENCY	PRICE EACH
500 Kc—800 Kc	$14.95
2.1 Mc—3.0 Mc	4.95
3.0 Mc—4.0 Mc	7.95
4.0 Mc—5.3 Mc	4.95
5.3 Mc—7.0 Mc	4.95

BC-733 RECEIVER. 108.3-110.3 Mc AM 6 xtal controlled preset channels. Contains a 90 cyc and a 150 cyc filter. Can be converted for aircraft monitoring or to receive signals from U. S. Space Satellites on 108 Mc. Complete w/10 tubes. Good Condition . . . $5.45

MOBILE POWER SUPPLY

Input: 12 VDC
Output: 400 VDC @ 180 MA & 220 VDC @ 100 MA
Completely filtered for ripple & noise. 7" H x 14" W x 8" D.
Wght: 28 lbs. New $12.95

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Completely waterproofed (actually submergence-proof) speaker. 6" dia., 16 ohm voice coil, 15 watts. Double-re-entrant type with a built-in, hermetically sealed, permanent-magnet, dynamic driver unit. Freq. response: 300-6000 cps. Wonderful for boats or any outdoor use. Regular price is $43.50.
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This new linear incorporates every desirable modern feature. Stable, with passive grid input, it offers a 50 ohm resistive load for SSB exciters. Operation is Class AB-1 for low distortion. Output is conventional pi network.

SB1-LA applies the desirable technique of low plate voltage (only 800 volts) and high plate current. This lower plate voltage is far easier on capacitors—diode rectifiers—transformers—insures safer operation under environmental extremes.

All-solid-state, 117V AC heavy-duty power supply is **built in.** (No rectifier tubes).

Tubes used are 6JE6's—six of them, parallel connected. These are standard, low cost types, available anywhere. (See specifications below for other features.)

$279.50

Please send full information on SB1-LA Linear and SB-33 Transceiver.

NAME

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CITY ZONE STATE

Bands: 80-40-20-15 meter amateur bands.
Power rating: 1000 watts P.E.P. input. (750 watts 15 meters). 400 watts AM.
Drive requirements: Approx. 75 watts for full rated output.
Input impedance: 50 ohms resistive.
Output impedance: (antenna) 50 ohms, unbal. VSWR 1.5 or less.
Power supply: Built-in all solid-state, 117V AC.
Primary power requirements: 115V AC @ 12A max. at peak output. (DC) **Standby:** 12.6V (nom) @ 7.5A. **Peak:** 12.6V @ 110A.
Tubes: Six, type 6JE6. (parallel connected).
Control circuits: Antenna switching relays (2) built in. Rear terminals for transceiver relay control.
Size-Weight: 5½"H, 11¾"W, 11¾"D. Weight 35 lbs. approx.

SBE SIDEBAND ENGINEERS
317 Roebling Rd. So. San Francisco, Calif. An operation of Webster Manufacturing

(W2NSD from page 71)

dandy Vee if six meters ever opens to Bermuda.

Well, I could go on about our other summer "help," but space here is limited. We'll be looking for a new crew next year. Have you thought about the possibility of spending a nice summer up in the beautiful mountains of New Hampshire?

Typewriters

Perhaps I can draw on the collected experience of 73 readers. Does anyone know of a typewriter that turns out the fine typing job (for offset printing) of the IBM Executive, but which doesn't need almost constant repairs? Hoot-Mon!

Polaroid

The new Polaroid 100 camera looked like it was just the ticket for a magazine editor. I bought one of the first out to see if it shaped up. I can report that it does an execllent job on black and white pictures, indoors, outdoors, or with flash. That little transistorized shutter control gives me perfect pictures every time, and this is valuable for magazine work. I've shot several packs of the color and am extremely disappointed with it. I don't know how the fellows in the camera magazines got those beautiful pictures, but mine all come out very dull and not much more interesting than black and white.

Poverty

There's a letter from a skeptic every week or so asking how I can plead poverty with a straight face while I am making trips to Europe, driving around in a Porsche, and keep telling about my big antennas and transmitters. It is difficult. But once you get used to being poverty stricken you can do almost anything you want without interfering with this state of mind.

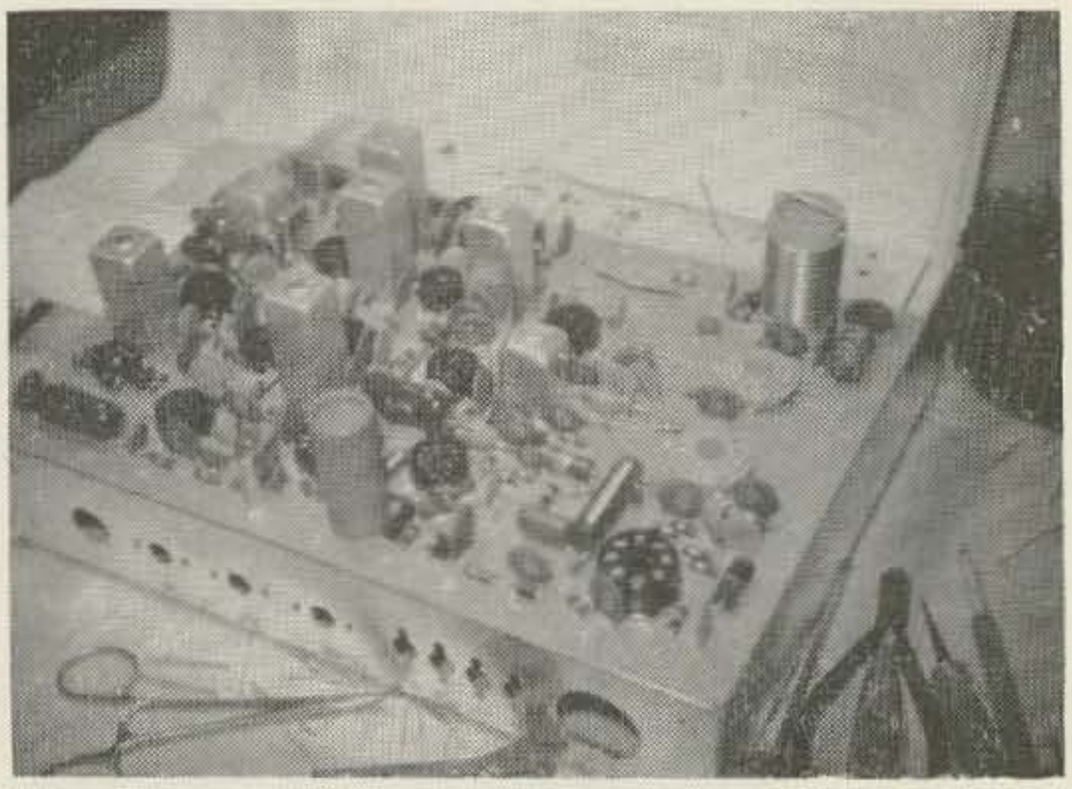
The philosophy involved may be difficult to accept. Basically it is to do as much as possible while spending the absolute minimum of money. This forces me to drive around ignominiously in a 1957 Porsche instead of a 1964, but it does get me around in a Porsche (pronounced por-sha). It means that in order to get over to Europe I have to tour direct 71 other people (which I enjoy anyway). It means that I have to swap off advertising space in 73 for equipment, make do with surplus at every opportunity and scrounge second hand gear whenever possible.

Being poor is fun.

. . . Wayne

The Heath HW-22 40 Meter SSB Transceiver

Charles Leedham WA2TDH



The Heath Company is right in the thick of the heavy current rush to SSB transceivers, their contribution being three one-band models covering 20,40 and 75. The prices of the non-kit transceivers coming out all over the place recently are enough encouragement to get started, finally, in sideband, but what could be more mouth-watering than a picture in a Heath catalog of a sideband transceiver with 200 watts PEP input, and for only 120? Not much. All of which sent me to the order blank in a hurry, bringing forth an HW-22, the 40-meter model. It wasn't as quick as all that, unfortunately, for the flood of orders for these units

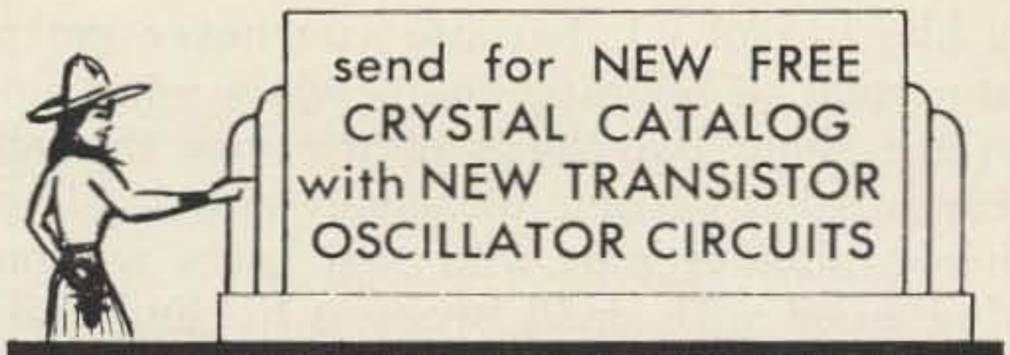
and their 75 and 20 companions has the Heath factory backed right up to the eyeballs with clamoring hams, but they expect to be caught up by the time you read this.

As a transceiver, considerable of the circuitry of the HW-22 is used for both transmit and receive, thus saving space and cost. The carrier oscillator is used for carrier generation in transmit and for insertion in receive, both signals go through the same crystal filter and one common *if* stage, the VFO serves the functions of both, and the transmit grid and plate transformers operate also (in reverse) as grid and plate transformers for the recieve rf stage. All to the good, incidentally, because with this sort of transceive operation, you know good and well that when you're receiving somebody, you're automatically and infallibly set up on this frequency when you return his call. The major overall difference from the multi-use set-up of a small AM transciever is that the audio stages are kept strictly to themselves—the receive audio output is not used as the mike amplification on transmit.

For transmission, a 12AT7 is used crystal controlled for the carrier, and fed to a balanced modulator (four crystal diodes in a balanced ring) for combination with the audio coming in two stages from a 6EA8. The carrier is balanced out (45 db down) with a tuning control and the wrong sideband is chopped out at the filter, also 45 db down. The HW-22, by the way, operates only in LSB, *really* a single sideband rig, but the absence of USB capability is no absence at all, as 99.9% of the operation on 40 meters is LSB by a sort of general unspoken agreement. From the filter the signal gets another boost before it meets the VFO frequencies at the transmit mixer, then to a 12BY7 driver and two 6GE5 output tubes in parallel.

The receive section is single-conversion, with a 2.305 meg *if* for good image rejection. The passband is 2.7 kc at the crystal filter, and the arrangement gives quite good selectivity. A 6EA8 rf amplifier brings the signal in to the *if* stages, and the other half of the 12AT7 carrier oscillator is the product detector. Two halves of a 6EB8 operate as the af output stages.

Construction of the HW-22 is simple enough, and considerably more so because all the tubes, transformers, crystals, oils and all but two or three of the other components are mounted on one large circuit board. It still takes time, and about halfway through I had the feeling that I was stuffing parts onto the board by day and that someone was sneaking in at night to pull them our, like Ulysses' wife with her knitting. Nonetheless, it is an enormous constructional improvement over hand-wiring (as the TV-set



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ads like to call it), because you never get to that normal kit-building point—where you know you are about two-thirds of the way through because it has become physically impossible to squeeze another part into that mess without hiring an elf with small tweezers to climb right in.

On this point, incidentally, Heath has supplied a major aid to overcome the complaints about the difficulties of servicing circuit-boards. Two pages of the manual are "X-Rays" of the board, showing the foil side and "through" it, the location of every component, numbered in relation to the schematic. This makes circuit tracing simple. Three other pages are given to charts of proper resistances at every point on the board, and proper voltages for receive and transmit at all pertinent points. Even before initial turn-on after construction, there are several stages of extra, point-by-point resistance checks to be made (the biggest list has about 60 checkpoints), just to be sure you've got everything in the right place and that there are no accidental shorts on the board from sloppy soldering technique—like mine. This aspect of the kit—as well as the basic transceiver design—has been well thought out by the people at Benton Harbor.

In operation, the HW-22 has performed quite satisfactorily. Operating into an inverted vee antenna at a rotten location in the middle of New York City skyscrapers, the transmitter gives enough punch to get good signal reports—good for readibility and all O.K. on clean signal—from one end of the country to the other, and the audio reports have been universally excellent. Provision is made for either push-to-talk or VOX, and the VOX circuitry performs admirably, picking up quickly and with adjustable release time. Relay click is very mild, and after a short period of operation is hardly noticeable.

The unit itself is quite pleasing in appearance, with a good, big VFO know and venier tuning for precision settings. The unit is used here as a base rig, but for mobile operation there is a gimbal bracket which can be screwed under the dash or even on the floorboard, with the HW-22 firmly held and tiltable to the most convenient operating angle.

Power requirements for the HW-22 are 800 at 250 ma peak, 250 at 100 ma, −130 at 5 ma for bias, and 12 volts filament at 3.75 amps. These requirements are of course met by the HP-23 power supply ($39.95) for the base, or the HP-13 Mobile supply ($59.95) for 12 to 14 volts. These solidstate power boxes also supply 6 volts for filaments and an adjustable (−40 to −130) bias for use with equipment other than the HW line. Power supply switching is handled remotely by the on-off switch at the transciever.

All in all, the HW-22 (and presumably the 75 and 20 models) looks like a hard unit to beat, especially at the price of $119.95. It tunes only 7.2 to 7.3 and has only LSB, but if you're going to operate SSB on 40, that's the only part of the band you can be in, and the only sideband you'll use. Add the ac power supply, and you're on 40 SSB with a respectable 200 watt PEP signal for only $160, which is mighty hard to beat. It is an ideal mobile rig, with very little final tuning ever needed, and for one-band base operation, it could even sit in the living room with hardly a sour note coming from other interested parties in the house. The cabinet is only 6 inches wide by 10 deep, hardly larger than a standard AM table radio in pre-transistor days. Poke the power supply out of sight under the table, and none of your friends will believe that you can talk across the country with that little box sitting there on the table. Of course, when you try to prove it to them, the band will be dead anyway, and they still won't believe you, but then that's ham radio for you. . . . WA2TDH

ham radio for you.

. . . WA2TDH

80 Words Per Minute

Old timers will be saddened to hear that Ted McElroy has passed on. Ted, one of the greatest CW operators of all time, could copy up to 80 words per minute and held the world's record at 73 words per minute. Few amateurs were not amazed to watch Ted at conventions copying code at these high speeds. He would start a tape at some easy speed down around 50 wpm and talk with everyone for a while then sit down and type with unbelievable speed. In a few moments he would look up and talk with agape watchers for a while and then type some more. Perfect copy. His sparkling wit will not be forgotten by the thousands who counted him their friend.

Voice of America

W2SKE's amateur radio program is broadcast every Sunday over most of the Voice of America transmitters. You can probably best hear it at 5:15-5:30 PM EST on 9530 kc, at 5:30 on 9720, or 5:45 on 9525 kc. Bill always has an interesting program so crank your receiver down and tune in next Sunday.

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Larry

VHF'ers, particularly those with the Heath Two'ers, or those who will be getting Two'ers soon (and that should cover the field fairly well), should look into the modification kit being offered by Lawrence Engineering, 36 Lawrence Road, Hamden 18, Conn. The Twoer transmitter does a fine job, and the only problems fellows find with the unit is the receiver, which, though quite sensitive, blocks easily when too many stations come on the band. Strong stations can raise the devil with a super-regen receiver. Lawrence Engineering has solved this problem with the "Super-Twoer" kit which transforms the Twoer receiver into a superhet, thus virtually eliminating overload problems. This also eliminates the receiver radiation normal to the super-regen and improves the sensitivity. All in all, for a couple hours work and $29.50 ($27.25 without tubes) you'll end up with a terrific transceiver. Everything goes inside the original Twoer; no cables hanging out, no outboard stages, no extra power required. W1JBQ and W1PXX have come up with a fine kit, look into it.

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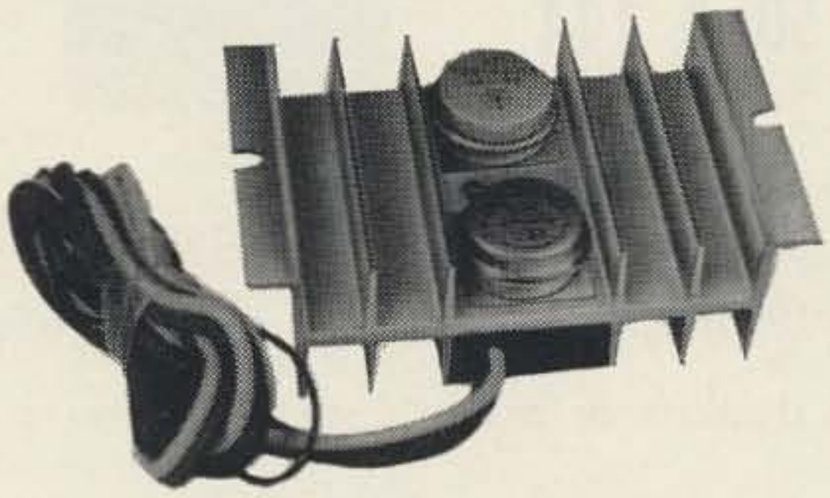

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Edson Snow W2BZN

After pursuing the standard treatment on the spark plugs, the distributor, the generator and the voltage regulator of my Falcon, I became aware of a clicking noise that could be heard on the weaker BC stations. Apparently the noise was being radiated since it grew worse in an expressway underpass, and could be heard on a pocket transistor radio anywhere in the car. On a rough road, or by tapping the dash of the car, the clicking became a buzz. By-pass condensers didn't seem to help.

Using the pocket radio as a probe and pulling off wires here and there on the car, the noise was traced to the voltage regulator which supplies the fuel and temperature gauge circuit. The Falcon circuit (Fig. 1) is fairly standard in Ford cars and is probably typical of a number of other cars. A cheap and dirty solution is a toggle switch a "X" to kill the circuit while listening to a weak one. However you could run out of gas or boil over without warning. Besides it is not too hard to fix if you understand the working of the simple circuit.

Under normal driving, the battery voltage varies from 12 to 15 volts. With the ignition switch "on," the regulator contact is first closed, applying the full battery voltage to the circuit, causing the coil in the regulator to heat the bimetallic strip, which bends and eventually opens the contact. This drops the applied voltage to zero. The strip then cools; the contact is remade and the cycle repeats. Like the thermostat at home which cycles to provide a constant temperature in your shack, this regular can be adjusted to provide an average of five volts at its output. Of course a conventional voltmeter placed at this point would flop back and forth like crazy. However, the gauges on your car are a modern version of the old hot wire meters, which depend for deflection on the heating effect of the current rather than a magnetic field. The gauges have long time constants and therefore read average values. With what appears to the gauge as a constant voltage, the circuit becomes a simple ohmmeter measuring the resistance of the rheostat in the fuel tank or in

the radiator water. The Ford Motor Company advised me that each gauge has a current draw from 60 to 200 milliamperes at five volts.

What we need is a non-clicking regulator that will take an input that varies from 12 to 15.4 volts and supply a constant five volts to a load that varies from 120 to 400 mils. This is a good task for semiconductors. The circuit in Fig. 2 would be practical if a 10 watt zener diode at 5.1 or 5.6 volts were available, or if the automaker designed his meter circuit for 6.8 volts or higher, where the higher current zeners are available.

I used the circuit in Fig. 3. A 400mw zener is used as a reference voltage controlling an NPN transistor as an emitter follower to handle the heavier current. The resistors in the circuit drop the voltages and protect the semiconductors from surges. The capacitor was found necessary for one transistor that wanted to oscillate.

The NPN transistor is something of a problem since there are not too many inexpensive ones that will handle 500 mils. The only other factor to consider is the voltage drop between the base and the emitter, and this will determine the correct zener diode voltage to use.

The RCA 2N1486 is ideal but costly unless you can salvage one from an engineer's breadboard! It will handle ten times the current and becomes only warm to the touch with just its regular mounting bracket. A heat sink was not necessary, nor was the .05 capacitor. The base to emitter drop averaged about 0.2 volts on those tested. With a 5.6 volt zener

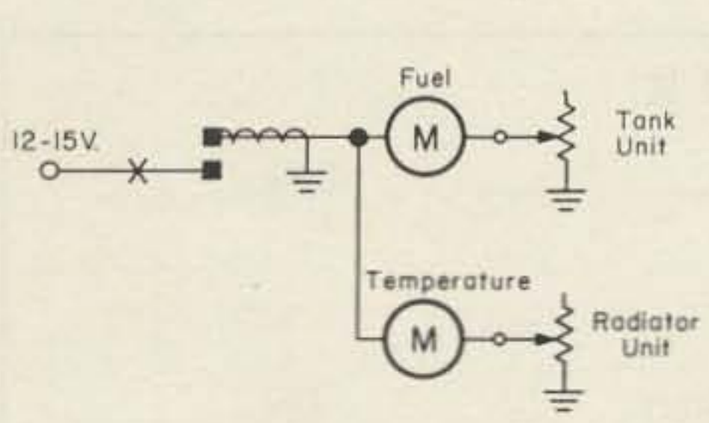


FIGURE 1

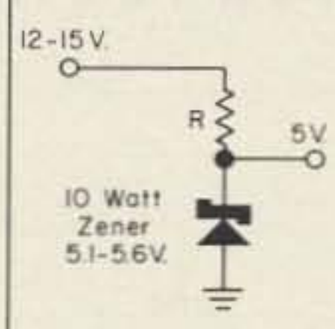
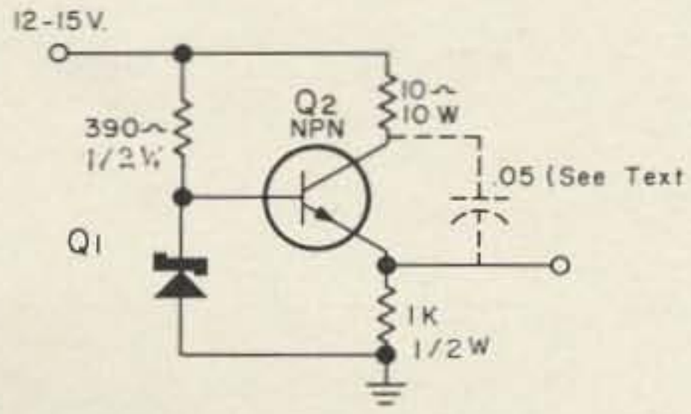


FIGURE 2



Q1 - IN752A 5.1V. Or IN753A 6.2V. (See Text)
Q2 - 2NI486 (RCA), 40053 (RCA) Or Equivalent (See Text)

FIGURE 3

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6116	$24.95@	829B	$6.95@
6940	$59.95@	833A	$34.95@
VA6975	$75.00@	6080WB	$12.50@
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Sarks T. Rect. (M500)	.55c@—2 for $1.00
Cambion coil ferrite slug (OD1" X ¼")	5 for $1.00
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Transistors Bendix—2N235A-2N235B	.55c @—2 for $1.00

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Gonset GR212—Exc. Cond.—General Coverage	$69.95@
RME6900—NEW—With mat. spkr.	$229.95@
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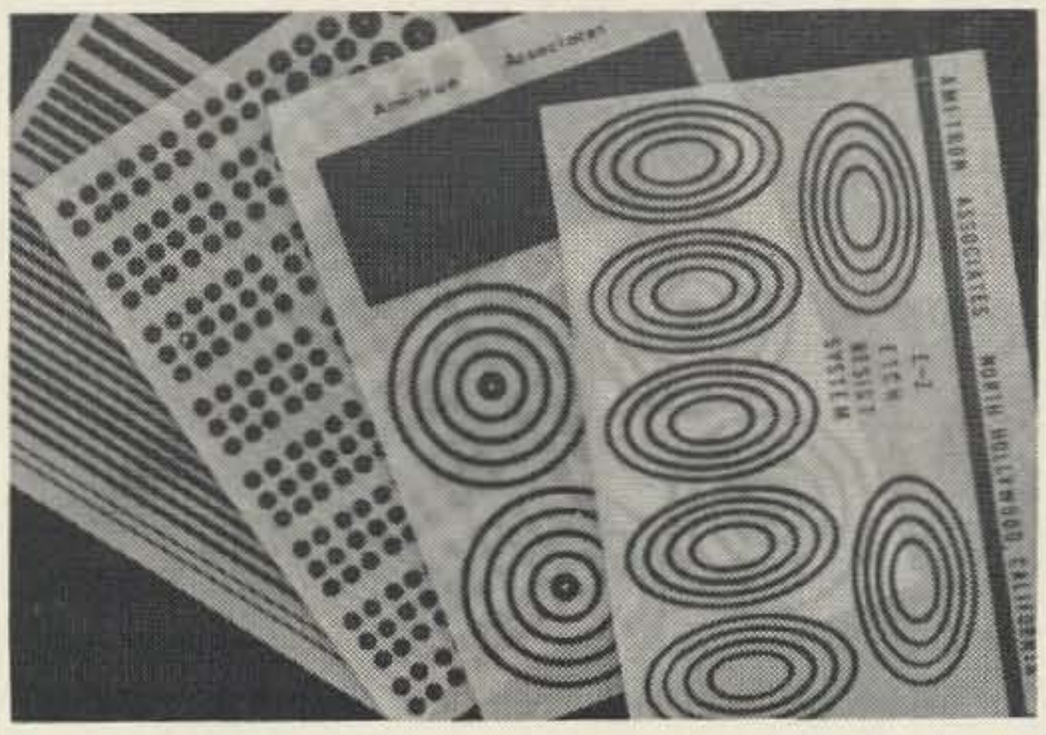
Gonset 6 meter linear pr. 826 in final	$129.95@
BC 348 with built in ac. supply	$69.95@
Tube testers used counter top checked out good cond.	$9.95@
Hickok tubetester model 546 good cond.	$49.95@

Mid-West Electronic Supply
54 Mia Ave. Dayton, 27, O.

E-Z ETCH



E Z ETCH lets you turn out professional etched circuits. Here's how it works. Select the image elements that you wish to use and position the "See-Thru" transfer sheet on the copper surface. The etch resist is applied to the metal by tracing over the back of the image with a pencil. The circles and elipses let you make broad arcs, sharp curves and switchbacks with ease. Each kit contains lots of lines and scads of pads so that just about any imaginable configuration can be made up. The 2 board kit is $5.95 ppd in the 48 states. Etchant and vessels are included. Complete Instructions.

Californians add 4% tax **No COD's, please**

E Z ETCH
12033 Otsego St.
North Hollywood, Calif.

(TI 1N753A), the output of the circuit held between 5.0 and 5.22 volts as the input voltage and load varied. It was quite satisfying to install this regulator and the original car regulator with a DPDT switch to be able to compare readings and convince the doubting that the noise can be eliminated.

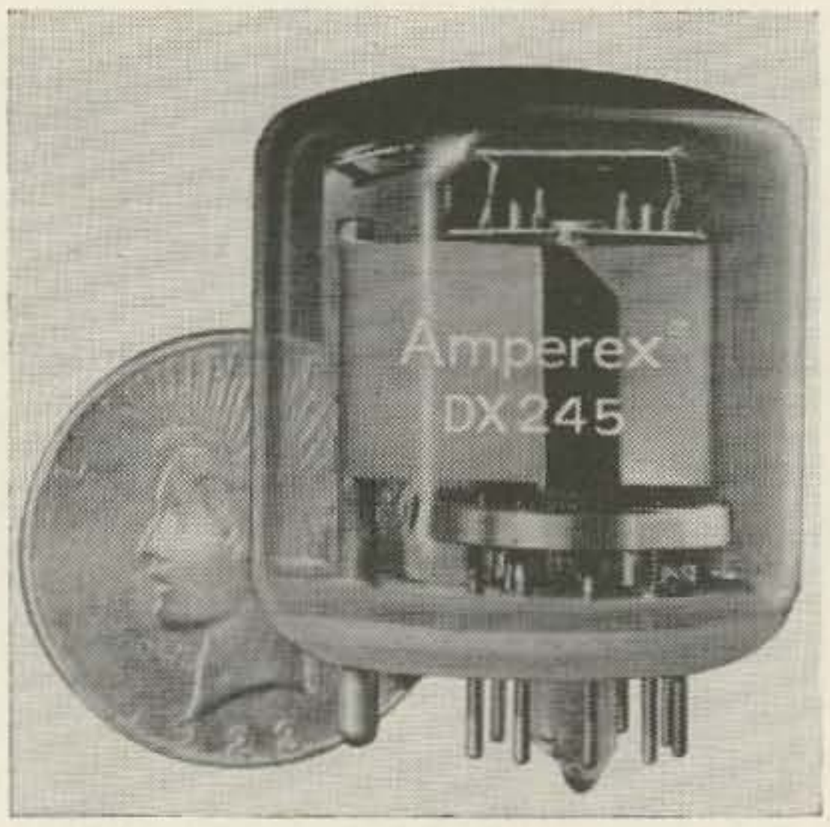
Since the 2N1486 goes for 13.20 net (at the recently reduced price) it doesn't seem a likely prospect for the ham trade, so I asked the local RCA rep to suggest something which would do the job more reasonably. After all there is nothing really precise about a gas gauge when there may be three gallons in the tank when the gauge reads empty!

The RCA rep suggested an RCA #40053 which nets for 1.40 in lots of 1-99 and can be obtained through local distributors. This is a silicon industrial NPN transistor in a JEDEC TO-5 package. It has a base to emitter drop averaging .7 volts among those tested. This means that the reference zener should be a 1N753A, 6.2 volts giving an output between 5.25 and 5.50 volts when the input varied between 12-15 volts and the load varied from 100-400 mils. This is a little above our 5 volt target but close enough for the car system. A 1N752A used here gave voltages under five volts. The maximum power dissipated by the RCA 40053 is 2.2 watts, therefore a heat sink is required. With the heat sink, the circuit ran all day long on the bench without heating too much. The .05 capacitor was found to be needed to tame some kind of an oscillation.

Construction is not critical. Just remember that the NPN transistor case can not be grounded to the car. Of course if your car has an ignition system with a positive ground, you can modify the circuit to use a PNP transistor and build it for "peanuts."

. . . W2BZN

New Products



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"Tungsol" 2N442, 100 watt, 15 amp.	$2.00
"Tungsol" 2N443, 100 watt, 13 amp.	$2.00
Planar transistors, NPN	$.50c ea.
"Transitron" 2N1208, NPN, Silicon, 12 MC, 45 Watt, 2 amp. (Stud) transistor	$2.00 ea.
1N217, "Hoffman" silicon rectifier	$.20c ea.
HB2, "Hoffman" Zener Diode	$.30c ea.
Zener Diode, Silicon, 12 volt; 1 amp.	$1.00 ea.
Zener Diode, Silicon, 12 volt; 10 amp.	$1.50 ea.
Rectifier Silicon, 400 PIV, 3 amp.	$.50c ea.
1N 537 — 1N 539 Rectifier, Tophat, (Raytheon, Motorola, G.E.)	$.30c ea.
Heat Sinks, Extruded Aluminum for both Power Transistors and Diodes	.45c to 75c
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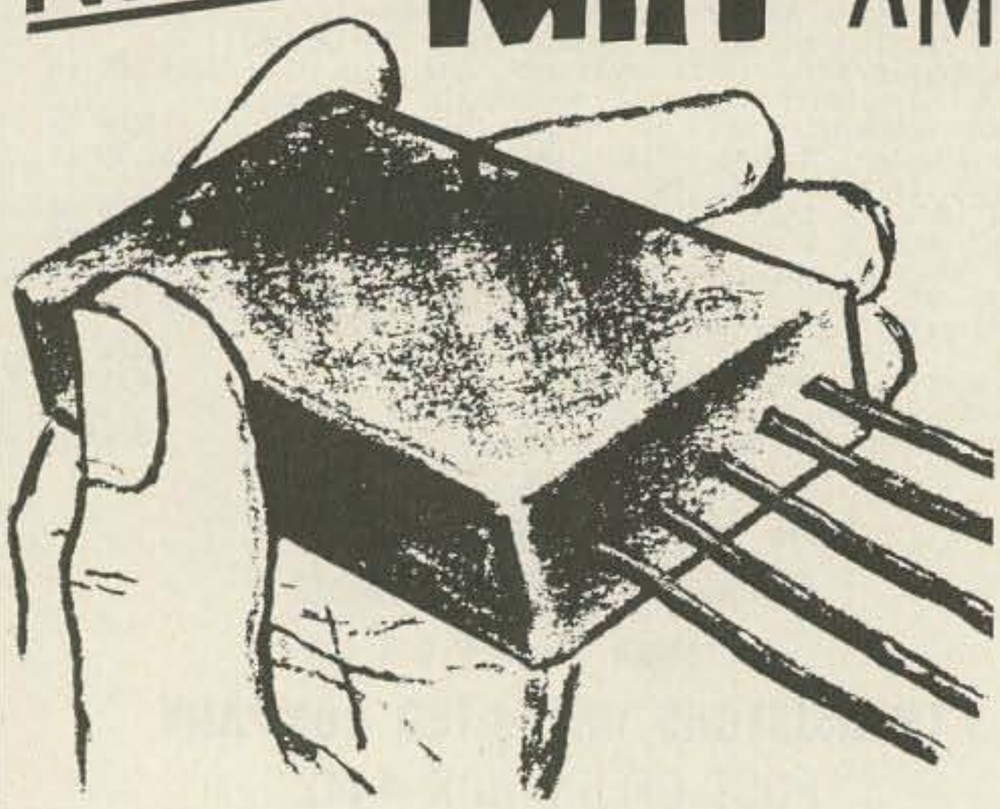

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Letters

Dear Sir:

In looking through the November '63 issue of 73 AMATEUR RADIO, on Page 32 I noted with interest, that you had an article titled "All Band Conical Antenna."

Please be advised that our Company manufactures the 450 ohm feed line that you mention. There are two things that we think might be of interest to anybody using this device.

First, we make a special Stand-off, which is sold by both Lafayette, Burstein-Applebee and many other people, which makes it very simple to handle the open wire material. Second, the same device also permits accurate, inexpensive, stubbing down or up to 300 or 600 ohm terminations.

It might also be of interest to you, since you mention on Page 38, the fact that the open wire is hot with rf when transmitting, that we also make a formvar covered open wire, which, of course, is absolutely insulated. We also make a polyethylene type of open wire, which also removes the danger of rf burns, or shorting against any conducting surface.

In reading further, you indicate the fact that provision must be made for use of feed through and standoff insulators. We enclose a catalog, which will point out exactly what we are talking about.

Some of the other people that carry this material are Harrison, Harvey, Allied, etc., and many other places throughout the United States, that cater to the ham.

Incidentally, you also mention high resistance leakage to ground. The formvar covered open wire or the insulated wire will negate these conditions, obviating the necessity for wrapping the open wire feeders at the contact points, with plastic electrical tape.

Last, but not least, you mention metal guy lines. Please

note that we make fiber glass guy line, which is non-absorbent, non-radiating, high strength wire. This should also make your problem considerably easier, since we make this in varying tensile strengths.

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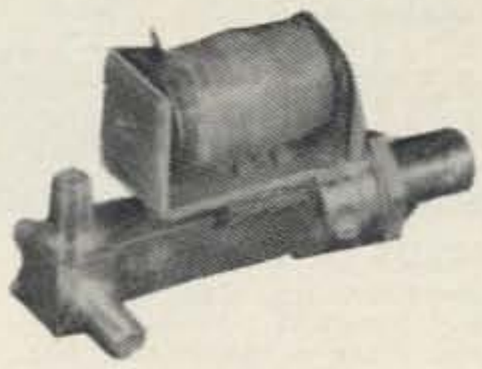

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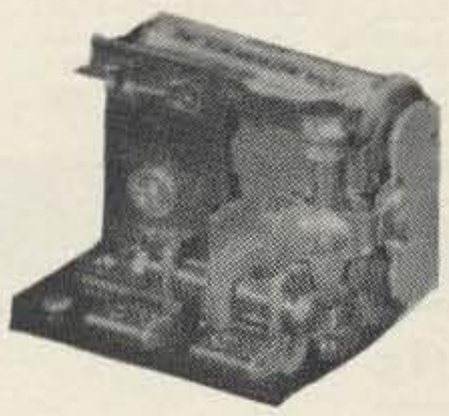

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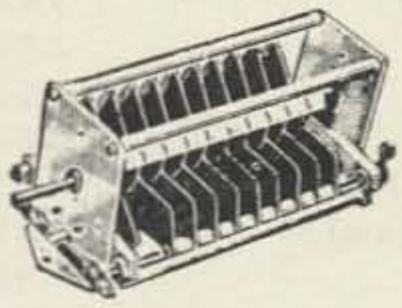

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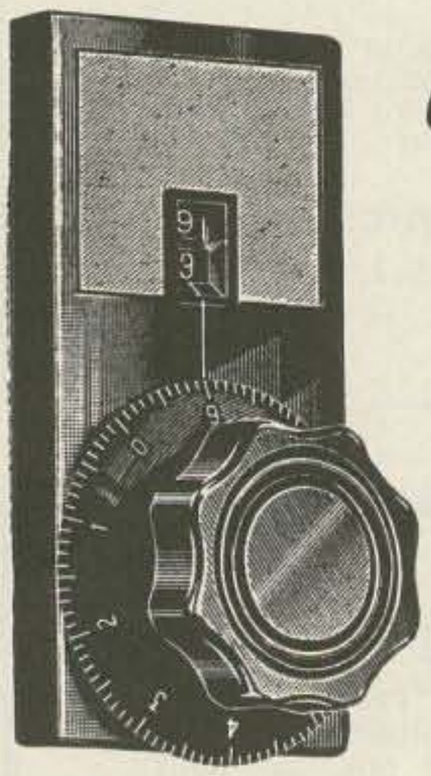

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A. E. Hankinson W5EVL

For several years now, several companies in the Amateur and "other" fields have been producing printed circuit boards. It would probably take quite a while to catalog exactly how many different companies are in the field, but undoubtedly among the best known would be International Crystal of Oklahoma City. For years they have sold 6 and 2 meter converters, small transmitters, preamplifiers to the Amateur fraternity. In addition to International Crystal, other small companies like Gem Electronics and Vanguard Electronics have come forth with converters and low power transmitters completely wired on neat little printed circuit boards.

For reasons I will go into later, I became interested in printed circuits several years ago and in the course of searching out information on the subject, ran across an advertisement by Irving Electronics of San Antonio, Texas. By expending a stamp and envelope, I obtained Irvings Catalog. The original catalog I received had possible 70 or 80 different printed circuit boards. These differed from the International Crystal type in that they were not completed units. Instead, they were the bare board, laid out and marked for drilling and mounting of components.

The circuits which these boards represent are among the popular circuits found in the various magazines and from results obtained, evidently have been well checked out prior to release. Just about every field of interest in Amateur radio, with the exception of Amateur TV seems to be represented. This includes audio equipment and RTTY units. The majority of these units are on boards which will fit very neatly into one brand or another of miniature chassis box.

My primary reason for becoming interested in these boards was to obtain an inexpensive, and as trouble-free a circuit as possible for a Club project The Club had decided to sponsor "on the air" code practice sessions on 6 meters using MCW and it was felt that with a printed circuit board where the majority of wiring was provided, that those interested in the code sessions but with limited funds and technical ability, could avail themselves of one of these boards. The idea was, and I still think it is, a very good idea. Unfortunately, those of us interested did not get the thing rolling until

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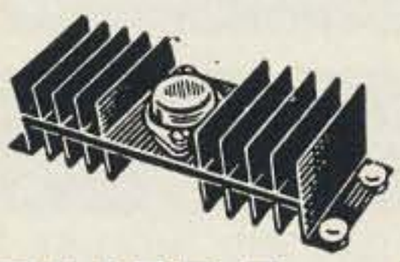

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late in the fall and somehow or other I found myself dipping printed circuit boards into an acid bath to produce a locally designed board.

It pointed out one thing very definitely! Don't produce printed circuit boards with circuits that require a knowledge of circuitry for inexperienced or would-be amateurs.

Looking back at it now, I can see that the Club project which was classed a success, would probably have been rated a colossal achievement if we had been able to steer all those interested into something like the 6 meter boards from Irving Electronics or Gem Electronics.

Now-a-days, things are looking even brighter. Irving has come out with a much longer list of boards including quite a bit of transistorized equipment and in addition, a new company has appeared on the scene. P/M Electronics of Seattle, Washington have issued a catalog containing 43 different items including a transistorized auto ignition system, several nice sounding VFO circuits and others. I noted particularly that they have a 160 meter converter board which should be a boon to those who have no 160 meter band included in their receiver range.

These boards are particularly nice for those trapped family men who are unable to abandon the family for the shack in the garage and

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yet are not permitted to bring equipment into the house. With these boards, one can work out of a small fishing tackle box as a parts and solder gun holder without upsetting the wife's nervous system.

While these boards as furnished by Irving and P/M will not satisfy the strictly "home-brew" types, they are a step in the right direction. Addresses for catalogs are Irving Electronics, PO Box 9222, San Antonia, Texas and P/M Electronics, Box 6288, Seattle 88, Washington.

You can mention my name but since they never heard of me, it will probably not influence them one way or another. . . .W5EUL

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Robert Foulkes K1UBP

About two years ago, the Hallicrafters Company brought out their multi-band low-priced transmitter, the HT-40. The author purchased one to use for stand-by and portable work. The HT-40 covers the bands from 80-6 meters, xtal controlled, and with a type of "controlled carrier" modulation. The RF section consists of a single tube as an oscillator-buffer multiplier driving the final amplifier. As could be expected, the keying note on the higher frequency bands suffered from this with a quite noticeable chirp on six and ten meters. This only happened when using xtal control as the external vfo was left running continuously while transmitting with keying being done in the buffer and amplifier stages. As much operation was done at K1UBP on six meter CW, the note had to be fixed. Rather than using a VR tube to stabilize the voltage on the oscillator, I simply cut the lead from the cathode (pin 1) of the 6CX8 oscillator from the keying circuit and grounded it. Now the oscillator runs continuously while transmitting

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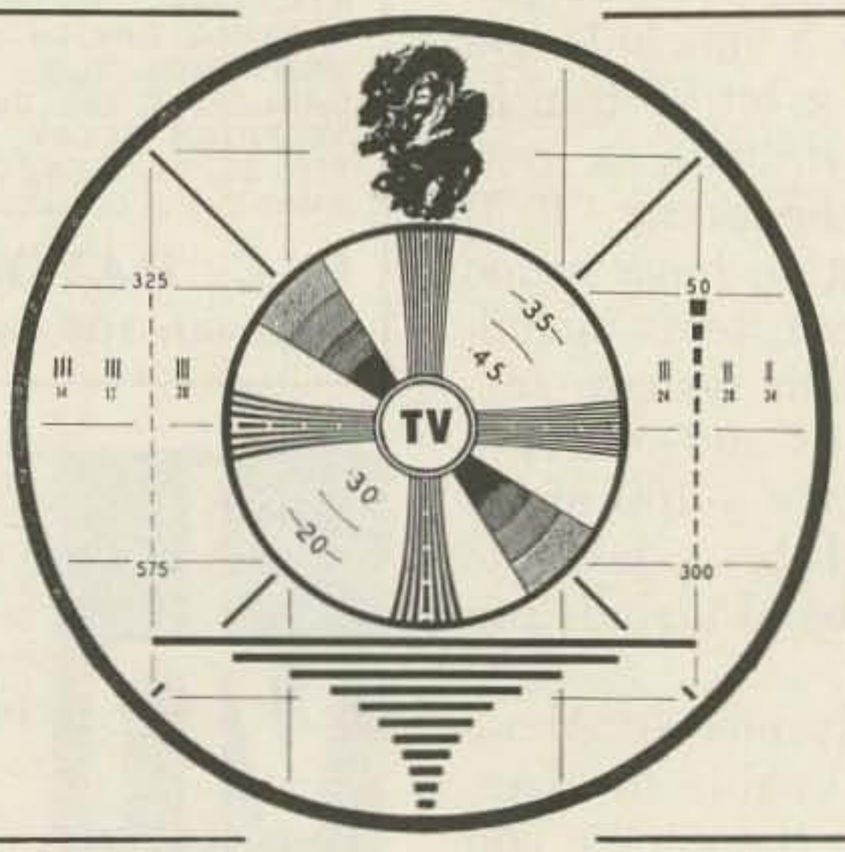

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While the rig was out of the cabinet, a metering circuit was also installed to allow "tuning for a dip" in addition to tuning for a maximum reading. A wire as soldered to pin 3 of the 6DQ5 and the other end was connected to a pin jack mounted on the back edge of the chassis. Another jack was installed which went to ground. Then a 0-200 ma meter can be connected to the pin jacks to read the final's cathode current. A dpdt switch was installed in the meter case to switch the meter in and out of the circuit. Now the old familiar dip can be seen.

Still another minor change was incorporated at this time. The pilot lamp is a NE-2 and a keying monitor was needed. So, the pilot lamp was converted into a keying monitor as per W1ICP in the September 1957 issue of *QST*. Another NE-2 could have been used, but to save space and simplify mounting, the pilot lamp was ideal. Have you ever tried to operate with a bunch of outboard gear hanging from rig in a crowded dorm? Maybe you should try it some time!

. . . K1UBP

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W9DUT-1 ..... $18.50

QRP TRANSMITTER. Have fun with this little one half watt CW rig on 40 meters. Uses any 40M surplus crystal. Kit supplies 1S4 tube and socket, condensers, resistors, coil, rf choke, terminal trip, etc. Runs from flashlight battery for filament and portable radio 67½ volt B-battery. See March '63 p22
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WA2WFW $4.25

TWOER MODIFICATION. Increase your selectivity considerably by installing a new triode 7587 nuvistor stage. This is our best selling kit to date. Everything you need for the modification is included. See June '63 page 56
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W9DUT-2 ..... $20.00

TUNING EYE KIT. This kit enables you to install a dual tuning eye in any transmitter to indicate the tuning of two or more stages. It works far better than a meter or even meter switching. See page 22, July '63.
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ATV Bulletin. In direct refutation to the ARRL claim that amateurs are lagging technically are the 2000 readers of the semi-monthly Amateur Television Experimenter Bulletin, edited by W0KYQ. If you are at all interested in amateur television you should subscribe to ATV, the only source of operating and technical info on this amazing branch of our hobby. Back issues are virtually all sold out, so don't put off subscribing. $1 a year for six issues.

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July 63	Algeradio	63	Graham Radio	July 63	Ready Radials
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86	Alltronics-Howard	Nov. 63	Grove	Sept. 63	Reed
Dec. 63	Amateur Elect. Supply	Aug. 63	Ham Trader	June 63	Rex
Feb. 63	Amateur Radio Exchange	Nov. 63	Hallicrafters	32	Reyco
Nov. 63	Amber	25	Hammarlund	Apr. 63	Ritco
July 63	American Crystal	Nov. 63	Harrington	35	Rohn
May 63	Amperex	Mar. 63	Harrison, Ivan	Nov. 63	Rowe
47	Amplidyne	85	Hayden	Dec. 63	R & S
66	Amrad	45	Heath	83	RW Electronics
Nov. 63	Antenna Specialists	51	Henry	Sept. 63	Sams
Apr. 63	Arrow Electronics	80	Hi-Par	82	Saxton
June 63	Arrow Sales, Cal.	83	Hi-Way	Feb. 63	Schober
84	Arrow Sales, Chi.	Oct. 63	Holstrom	73	Sideband Engineers
Oct. 63	Badges	Aug. 63	Howard	Apr. 63	S. J. Electronics
Sept. 63	Bald Eagle	Nov. 63	Hunter	July 63	Skylane
83	BC Electronics	Ooct. 63	Hy Gain	July 63	Slep
Apr. 63	Best	66	Identoriate	87	Space
Oct. 63	BF	May 63	Instructograph	Dec. 63	Spitz
Oct. 61	British Radio	17	International Crystal	Nov. 63	Sprague
69	Burghardt	78	Irving Electronics	29	Squires-Sanders
63	B & W	Oct. 63	Jays	June 63	Star
81	Byron Airpack	81	Jefftronics	80	Subscriptions
86	Calamar	Nov. 63	Johnson	Nov. 63	Super-Q
	Callbook	Jan. 63	Kar-Tenna	19	Swan
Aug. 63	Candee	Nov. 63	Kniper	June 63	T A B
June 63	C & H	Sept. 63	KTV Towers	Feb. 63	Technical Manuals
July 63	Charter Oak	June 63	Ladd	53	Technical Material
28	Clegg	77	Lafayette Radio	June 63	Telemarine
Oct. 63	Cleveland Institute	39	Linear Systems	31, 55	Telrex
July 63	Collins	78	L R Electronics	Apr. 63	Tepabco
Nov. 63	Columbia	79	Madison	75	Texas Crystal
May 63	Columbia Products	July 63	Maps	43	Thermoelectric D.
33	Comaire	Apr. 63	Master Mobile	61	Topaz
25	Cornell-Dubilier	Dec. 63	McCoy	Jan. 63	Transceivers
61	Coral Cliffs	85	Meshna	81	Transistors Ult.
39	Cubex	May 63	Metrodynamics	31	Trans Pro
23	Cushcraft	79	Midwest	Nov. 63	Trice
59	Dames	June 63	Miller	Nov. 63	Tri-Ex
Apr. 63	Delta	July 63	Mini- Products	June 63	Tri-State
86	Denson	71	Mission	Aug. 63	United
59, 65, 66, 86	Dow Key	Dec. 63	M & M	Feb. 63	US Crystals
84	Dow Radio	Jan. 63	Mor-Gain	Cover II	U. T. C.
37	Drake	Nov. 63	Mosley	Apr. 63	Valley
Mar. 63	Ebco	Cover IV	National	63, 66, 84	Vanguard
Dec. 63	Editors & Engineers	Dec. 63	Newark	Oct. 63	Verns
Feb. 63	Ed-U-Cord	May 63	New Products	July 63	Versatronics
Mar. 63	Electro-com	Aug. 63	Newtronics	Feb. 63	Vesto
June 63	Electronic Servicenter	July 63	North American	85	V & H
Oct. 63	Emrad	78	Northwest	Jan. 63	Vibroplex
66	Epsilon Records	Dec. 62	Nortronics	Oct. 63	WA6DUW
63	Evans	Aug. 63	Ole's	57	Waters
79	E-Z Etch	61	Ontario	Sept. 63	Webster
6	E-Z Way	May 63	Out-O-Door	Oct. 63	Western (Calif.)
84	Fair	June 63	Palmer	83	Western (Neb.)
July 63	Fairbrother	32	Parks	86	Wildcat Press
31	Fichter	81	Pauls Surplus	Cover III	World Radio Labs
Dec. 63	Finney	65	Pausan	Apr. 62	Zalytron
Dec. 63	F-M	43	P & H	80	73 Subscriptions
Aug. 63	Foreign Projects	83	Poly-Paks	88	73 Products
86	Foreign Subs	Mar. 63	Polytronics	88	73 Parts Kits
Dec. 63	Fulton	87	Propagation Products	31	6 Up
Dec. 63	Gain, Inc.	July 63	QTH MAPS		

58	JUN	ATV With The ART-26
100	JUN	Receiver For 220, The R-48/TRC-8
102	JUN	3 Coils For The ARC-5
106	JUN	Still Another 2 M Conversion, T-67/ARC-3
70	SEP	The Q 5er Reborn
32	DEC	432 MC. Exciter From The ARC-27

TEST EQUIPMENT

28	JAN	Transistorised Audio Frequency Meter
52	JAN	Scopes And Such
62	JAN	The Heath Cantenna
88	FEB	A Precision Frequency Standard
60	MAR	Measure L And C
15	APR	Temperature Limited Diode Noise Generator
80	MAY	The Knight-Kit P-2 SWR/Power Meter
20	JUN	The Lazy Mans Coils Evaluator
72	JUL	New Look In R. F. Ammeters
15	AUG	Simple Noise Generator
46	AUG	R. F. Wattmeter
68	AUG	The SWR Meter
42	NOV	A Simple A. C. Adaptor

TEST REPORT

48	JAN	The Knight-Kit T-150
62	JAN	The Heath Cantenna
62	FEB	Viking Personal Messenger
80	FEB	I & C Speak-Easy
84	MAR	The Eico 723
18	APR	Sigma Series 4500 Polar Relay Test Set
78	APR	The NCX-3
90	APR	The Swan SW-240
98	APR	Waters Coaxial Switches
71	MAY	Altec 460A Transistor Compressor Amplifier
80	MAY	The Knight-Kit P-2 SWR/Power Meter
86	MAY	Speech Compressor (Metrodynamics)
26	JUL	Hammarlund HX-50
46	JUL	Paco G-15W G. D. O.
26	JUL	Knight Kit R-100A
78	JUL	HO-10 Scope (Heath)
66	AUG	Add On Circuit (International Crystal)
52	SEP	Heath HX-20
66	SEP	Monitor Scope
16	OCT	Clegg Thor

TUBES

44	FEB	The RK 715-B A Neglected Tube
24	DEC	The UR Tube

V. F. O.

24	APR	Vector V. F. O.
56	APR	A Compact V. F. O. Dial
86	OCT	A Novel Type High Capacitance V. F. O.

VHF

32	MAR	Building A 6 And 2 Portable Transceiver

VHF RECEIVERS

8	MAR	A Nuvistor 2 Meter Pre-Amp
11	MAY	A 6DJ8/ECC 88 Converter For 6M
8	JUL	Sizzling 6 M Converter
26	SEP	A VHF Receiver
40	SEP	UHF Cavity Design
44	OCT	144 MC. Nuvistor Converter
16	NOV	432 MC. Converter

VHF TRANSMITTERS

10	FEB	6 M SSB
28	MAR	Amateur TV Transmitter
30	MAY	A 60 Watt 6 M Transmitter
8	JUN	Instant 220 AN/DMQ-2
58	JUN	ATV With The ART-26
22	JUL	The Buck-A-Watt 6 M Transmitter
16	DEC	50 MC. DSB
32	DEC	432 MC. Exciter From The ARC-27

TELETYPE EQUIPMENT BARGAINS

All equipment described below is in good operating condition. All came right off an operating line and all motors are new or nearly new synchronous. All typing units have Weather symbols. These replace 13 FIGS. STOP is optional, and some weather machines do have STOP. The other twelve are — ? : $! & ' ( ) . ; " They enable professional copy of weather stations, without interfering with communication send/receive. All are FOB Beverly Hills, Calif. **Note on freight costs:** Teletype takes a very low freight rate, & you should check with your local interstate trucker. You will be pleasantly surprised. The AC-21 Cabinet is a rounded-corner special operating console replacing the usual table & has provisions for all machinery & for the wide and narrow paper roll feed bins. They are approx. 2½'x3'x4' high. No power supplies came with this lot, because the entire U-shaped bank of consoles which were dismantled for this lot were fed by a pwr. line from a remote point.
In the lot were extra Mod. 14TD's (Transmitter-Distributors) which is the device that reads out the punched tape you feed it. Shpg wt 40 lbs. **$75.00**

In AC-21 Cabinet to be sold as a complete unit: **Mod. 19, plus No. 14 Typing Reperforator.** This setup includes a Mod. 15 machine, with Perforator-Transmitter keyboard; and Perforator-Transmitter which is what you punch tape with, using the keyboard to do it, either during sending or during receiving a message other than what you are typing, or just to punch a tape; and a Mod. 14 TD; and the Mod. 14 Typing Reperforator. This machine punches chadless tape, & prints the corresponding character above each row of holes, and does it electrically, so you can have an incoming message punch a printed tape for future retransmission without having to retype it. Shpt wt approx. 400 lbs,
Entire setup **$275.00**
Time Pay Plan: $27.58 down, & 12 monthly payments of $22.68 each.

In AC-21 Cabinet to be sold as a complete unit: **Mod. 15 with keyboard,** plus **Mod. 14 TD** plus **Mod. 14 Typing Reperforator.** With the electric connections to the latter, you can punch tape in every mode of operation, and also have the incoming message do it automatically. Ship wt approx. 370 lbs, all **$250.00**
Time Pay Plan: $25.06 down, & 12 monthly payments of $20.62 each.

HIRE OUT TO FIND TREASURE & BURIED PIPE

All you need is this like-new MINE DETECTOR, complete with Handbook & plastic suitcase, complete, AN/PRS-3 (Late Type!), 23 lbs. fob Tacoma, Wn. $37.50

POWER SUPPLY FOR ART-13 & OTHERS

Navy 20122, not specifically for ART-13, but puts out filtered dc 1300 v .35A, & 500 v .425A, plus unfiltered DC 50 v, .45A. There is plenty of room, so substitute your own 24 v 10A xfrmr & modern silicon diodes. 2 pair of 836's make the HV's. All controls & 3 meters on front panel. In handsome cabinet 37" h, 21" wd & 15" deep. Net wt 229 lbs. No plugs. BRAND NEW, w/schematic, instructions, & 7 parts—locations pictures. Cost Navy $1000.00. Shpg wt FOB Tacoma, Wn., is 360 lbs, but truck rate as xfrmrs is low and price is only **$79.50**

BEST SURPLUS HAM RECEIVER—WIDEST COVERAGE OF ANY

Hallicrafters/Belmont Communications Receiver R-45/ARR-7 and 60 cy pwr supply & cord, ready to use. Continuous tuning 550 kc to 43 mc. 6 bands: .55-1.6, 1.6-3, 3-5.8, 5.8-11, 11-21, 21-43 mc. Large translucent back-lighted dial. Vernier knob takes plenty turns per mc; or switch motor on and let it tune slowly back and forth. You set automatic-reversing limit stops. Drift: Manual says less than 1% from cold start, but it's really much less. The separate 6SA7 osc. gets regulated voltage from a VR-150. Sensitivity: Manual says better than 10 uv at 10 db s/n on all bands for 50 mw out; actually is much better. 6AB7 and 2 6SK7's amplify RF; separate 6SA7 mixer; and 2 6SK7's are 455 kc I.F. Add Hallicrafters know-how. Selectivity: Manual shows curves ranging from 100 cy to 10 kc pass; 3 crystal and 3 I.F.-pass (6 total) switch positions. Also Crystal Phasing control. S-Meter; 6 db/unit; adjustable. AVC-MVC switch and separate AF and RF Gain controls. CW-MCW switch: Separate 6J5 osc. Pitch Control on panel. Audio: 6H6 det-avc-noise limiter. Noise Limiter switch on panel. 6SQ7 ampl. 6V6 feeds 600 to 8000 ohm phones. Video: SO plug from Cathode Follower in 6V6 ckt shows sound on any test scope. Panoramic: SO plug feeds any 455 kc Panadapter. Case: 10 7/16" wd, 19¾" deep, 7¾" high. Power supply 5" wd, 8¼" ht, 13" dp. With schematic and illustrated alignment and adjustment instructions.

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fob San Antonio, Texas .....
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ELECTRICALLY-CHECKED Q-5'ER

BC453B: 190-550 kc 6-tube superhet w/85 kc IF's ideal as long-wave rcvr. as tunable IF & as 2nd convert. W/all data. CHKD. ELECTRICALLY! Grtd. OK! 11 lbs. fob L. A. $12.95

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Propagation Charts

J. H. Nelson

EASTERN UNITED STATES TO:

GMT–	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7	7	7	7	7	7	7	7	7*	14	14	14
ARGENTINA	14	7*	7	7	7	7	14	14	14*	21	21	14*
AUSTRALIA	14	7*	7	7	7	7	7	14	14	7*	14	14*
CANAL ZONE	14	7	7	7	7	7	14	21	21	21	21	14*
ENGLAND	7	7	7	3.5	3.5	7	14	14*	14*	14	7	7
HAWAII	14	7	7	7	7	7	7	7	7	14*	21	14*
INDIA	7	7	7	7	7	3.5	7*	14	7*	7	7	7
JAPAN	7*	7	7	7	7	3.5	7	7	7	7*	7	14
MEXICO	14	7	7	7	7	7	7	14	21	21	21	14*
PHILIPPINES	7*	7	7	7	7	3.5	7	7	7	7*	7	7
PUERTO RICO	7	7	7	7	7	7	14	14	14	14*	14	14
SOUTH AFRICA	7	7	7	7	7	7	14	21	21	21	14	14
U.S.S.R.	7	7	3.5	3.5	7	3.5	7*	14	7*	7	7	7

CENTRAL UNITED STATES TO:

GMT–	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	7	7	7	7	7	14	14	14
ARGENTINA	14	7*	7	7	7	7	7	14	14*	21	21	21
AUSTRALIA	14*	14	7*	7	7	7	7	7	14	7*	14	14
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	3.5	3.5	3.5	7	14	14*	14	7	7
HAWAII	14*	14	7	7	7	7	7	7	7	14	21	21
INDIA	7	7	7	7	7	7	7	7	7*	7	7	7
JAPAN	14	7*	7	7	7	7	7	7	7	7*	7	14
MEXICO	14	7	7	7	7	7	7	14	14	14*	14*	14
PHILIPPINES	14	7*	7	7	7	7	7	7	7	7*	7	7*
PUERTO RICO	7*	7	7	7	7	7	14	21	21	21	21	14
SOUTH AFRICA	7*	7	7	7	7	7	7	14	14*	21	14*	14
U.S.S.R.	7	7	3.5	3.5	7	7	7	7*	7*	7	7	7

WESTERN UNITED STATES TO:

GMT–	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	7	7	7	7	7	7	14	14
ARGENTINA	14*	14	7	7	7	7	7	14	14*	21	21	21
AUSTRALIA	21	14*	14	7	7	7	7	7	7	7	14	14*
CANAL ZONE	14	7	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	3.5	3.5	3.5	7	7	14	7*	7	7
HAWAII	21	14	7*	7	7	7	7	7	7	14	21	21
INDIA	7*	14	7	7	7	7	7	7	7	7	7	7*
JAPAN	14*	14	7	7	7	7	7	7	7	7*	7	14
MEXICO	14	7	7	7	7	7	7	7	14	14	14*	14
PHILIPPINES	14	14	7*	7	7	7	7	7	7	7	7	14
PUERTO RICO	14	7*	7	7	7	7	7	14	14*	14*	21	14*
SOUTH AFRICA	7*	7	7	7	7	7	7	7*	14	14	21	14
U.S.S.R.	7	7	3.5	3.5	7	7	7	7	7*	7*	7	7

Items of Interest

January propagation looks pretty rough. This is typical of January during the LOW portion of the sunspot cycle. The best time for DX is during your LOCAL TIME morning hours if working EAST, and during your late afternoon and early evening hours if working WEST. In other words follow the sunlight on 14 or 21MC.

We have not yet reached sunspot minimum although it is quite low. The actual minimum should be reached, however, during the next 10 or 12 months.

Good: 16-17, 23-25
Fair: 8-10, 12-13, 18-22, 26-27
Poor: 1-7, 11, 14-15, 28-31
Es: 8-10, 16-18, 22-24 (High MUF and/or freak conditions)

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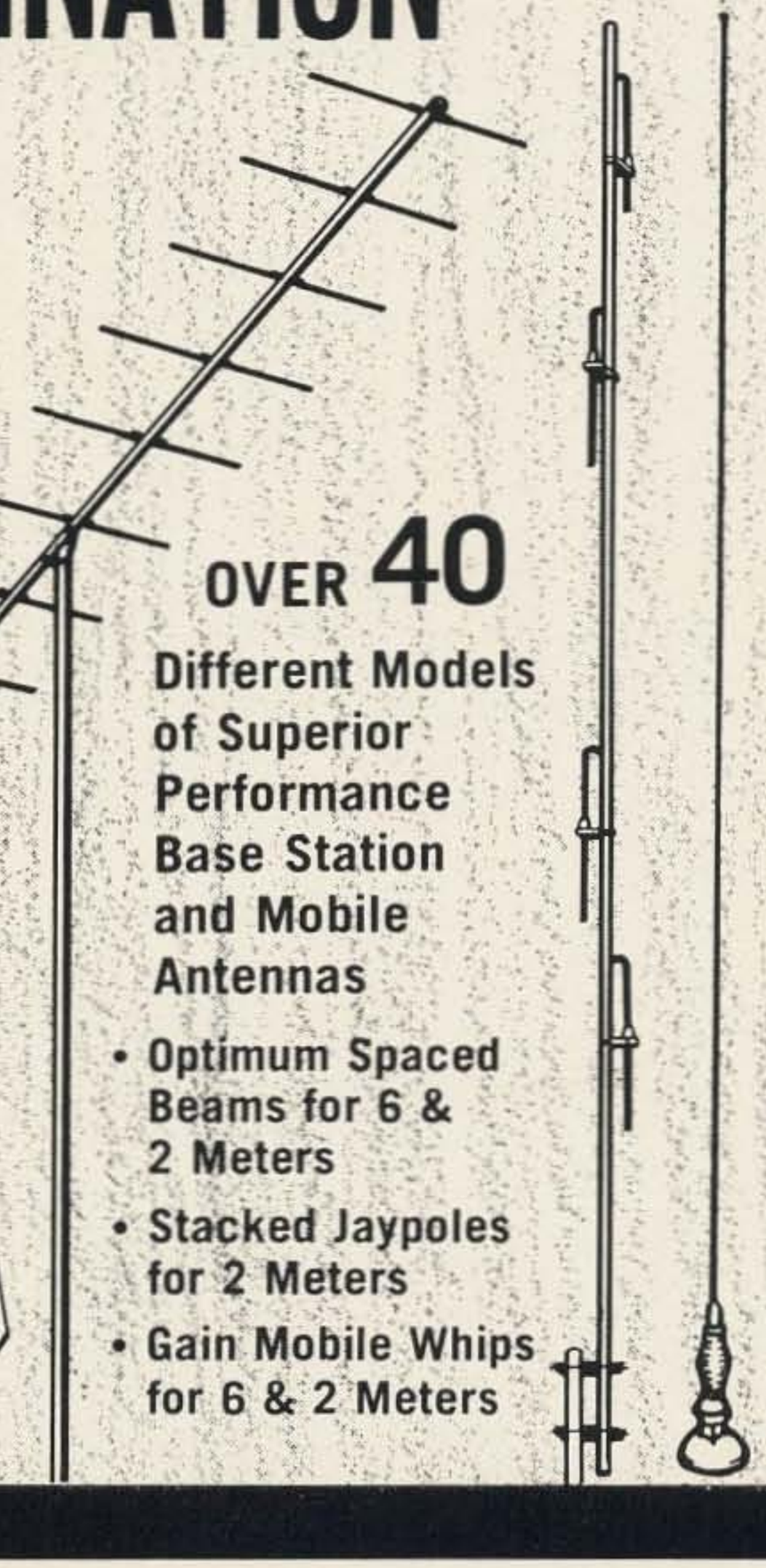

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